The Relationships between Periodontal Disease and Oral Health-Related Quality of Life in the Urban Older Population in Indonesia

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Declaration

I declare that this thesis was composed by myself, that the work contained herein is my own except where explicitly stated otherwise in the text, and that this work has not been submitted for any other degree or professional qualification except as specified.

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Abstract

Improvement in prevention of disease and effective management of health are leading to increased life expectancy globally. This increased life expectancy is associated with challenges for the global public health in relation to the burden of chronic non-communicable diseases (NCDs). These chronic diseases often reduce the quality of life of older people.

Dental caries and periodontal disease have been identified as the two most significant oral NCDs in terms of the burden of disease globally. It has been estimated that periodontal disease is the 11th most prevalent disease worldwide. Despite this prevalence and the potential burden of periodontal disease to the global population, there are fewer epidemiological studies and dental public health interventions about periodontal disease compared with those for dental caries. Very few qualitative studies have been performed concerning periodontal disease and quality of life, especially in the context of developing countries.

This thesis attempted to bridge this knowledge gap in the relationship between periodontal disease and oral health-related quality of life (OHRQoL), in a developing country, using an urban older population in Indonesia as its sample. The thesis presents a mixed-methods approach to scrutinise the relationship between periodontal disease and OHRQoL as well as to describe personal periodontal disease experiences in the older population in Indonesia.

The quantitative data were collected from three districts in Depok, West Java province, Indonesia. Three hundred and sixty-three participants were involved and met the inclusion criteria to participate in the first stage of the data collection, which included an oral health examination and questionnaire completion. It was found that only around 3 per cent of these older people had a healthy periodontal condition, and 97 per cent had periodontal pockets (75% had generalised periodontitis and 22 % had localised periodontitis). In the qualitative phase of the data collection, 31 participants who met the inclusion criterion, of having chronic generalised periodontitis, were interviewed using

semi-structured interviews. The interviews were processed until thematic data saturation was achieved.

The findings of the analyses reported in this thesis highlight some distinctions between the quantitative and qualitative findings regarding the impacts of periodontal disease on OHRQoL. The quantitative data showed a lack of statistical evidence for a relationship between periodontal disease status and OHRQoL measured using the short form of the Oral Health Impact Profile (OHIP-14). However, the qualitative data demonstrated that oral health symptoms likely related to periodontal disease affected the well-being of older Indonesians living in an urban population. These older people described how the oral symptoms related to periodontal disease brought some impact on their daily life beyond pain, physical discomfort, and restrictions of physical functions. The symptoms of periodontal disease also affected the psychological and social aspects of everyday life.

This study demonstrated an agreement between the quantitative and qualitative data regarding the negative impacts of both clinically identified and self-reported tooth mobility on well-being. This relationship was confirmed based on the prevalence, severity, and extent of the impacts measured. The older people described the daily life problems caused by tooth mobility as something noticeable and hard to ignore.

These data also found that individuals and environmental characteristics might also considerably affect the OHRQoL of the population under study. These predictors are brushing habits, dental visit, family income, and subjective assessment of dental health which had a significant association with the OHRQoL. In addition to this, other clinical measures of oral health, such as DMF-T and teeth with furcation involvement, were significantly associated with reported OHRQoL in this sample.

Finally, the qualitative data highlighted a widespread belief that the symptoms of periodontal disease were inevitable consequences of the normal ageing process. This belief alongside the individuals and environmental

characteristics of the older people might explain the discrepancy in the results between quantitative and qualitative data in this study regarding the relationship between periodontal disease status and OHRQoL. The belief affected older people' perceptions and reactions toward their symptoms of periodontal disease, and more broadly toward their expectations regarding normal oral health and function in old age.

Lay summary

People worldwide are living longer due to improvements in public health and in the prevention of disease. Generally, the population of the world has an increasing opportunity for the effective management of disease. The risks of contracting non-communicable diseases (NCDs), which is not passed from one individual to another, are also increasing as individuals live longer. These chronic diseases potentially reduce the quality of well-being and normal functions in older people.

Tooth decay and gum disease are the two most common oral disease experienced by individuals globally, both of which form part of the global burden of NCDs. Both of these oral diseases bring problems which affect individuals' daily life functions. Gum disease itself is the 11th most common disease experienced by people worldwide. Despite the widespread nature and the potential issues associated with the gum disease, we have found fewer published studies and dental public health programs which focus on gum disease and its prevention compared with those for tooth decay. There were also very few studies focus on understanding gum disease experiences and its impact on people's well-being, particularly from developing countries.

This study combines the objective data by examining people's oral health and subjective data about their experience of gum disease and how it affects their quality of life. We have chosen an urban population in Indonesia as our sample to help develop an understanding of how gum disease impacts in a developing country as much of the current data relates to the developed world.

Our data were collected from three districts in Depok, a city in the West Java Province of Indonesia. Three hundred and sixty-three participants over the age of 50 were involved in the first stage of the data collection, which included an oral health examination and the completion of a questionnaire. These quantitative data showed that three per cent of these older people had healthy gums, and 97 per cent had gum disease. In 75 per cent of the sample, the gum disease was distributed round their mouths, and in 22 per cent the gum

disease was localised to a small number of teeth. We wanted to explore further the experiences of people with generalised gum disease so we undertook detailed interviews with 31 of the people we found with this pattern of disease. We were looking for data related to individuals' experience of gum disease and how this disease affected their life and we could not detect any new "themes" for the last five interviews we undertook, thus we stopped gathering further information at that stage. The analysis of these interviews provided our qualitative data for the study.

There were some differences between the quantitative measures and feelings expressed by the participants among our outcomes. Gum disease was measured clinically during the oral health examination. The impact of gum disease was assessed subjectively in the whole sample using a questionnaire which provides each individuals self-assessment of their oral health condition related to well-being and normal oral health functions. The analysis of these data found limited evidence of a relationship between our measures of gum disease and older people's well-being. However, the qualitative data showed us that symptoms related to gum disease affected urban older Indonesians' well-being and oral function. Pain, physical discomfort, and restrictions in function were identified as the negative impact of gum disease. In addition to this, these older people also described the unfavourable implications of gum disease for their mental and social life.

This study also identified an agreement between the quantitative and qualitative data regarding the impact of loose teeth on human well-being. The problems caused by loose teeth were perceived as something noticeable and hard to ignore by the older people who were involved in the qualitative interviews.

Our qualitative findings underlined a widespread misunderstanding in this society that the signs and symptoms of gum disease were a part of ageing. This misunderstanding potentially influenced older people's perceptions and reactions toward their symptoms and experiences of gum disease. Moreover, this misunderstanding might also affect their expectations regarding "normal"

oral function in old age. This misunderstanding alongside individual and environmental aspects of the sample may help to explain why we have found different results between the quantitative and qualitative data in this study regarding the impact of gum disease on older people's well-being.

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Edinburgh, July 2020

Marisza Hijryana

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Chapter 1 Introduction

1.1 Background of the study

Gingivitis and periodontitis are the two major forms of inflammatory disease affecting the supporting tissues of the teeth. Gingivitis is characterised by soft tissue inflammation and does not result in bone destruction around the teeth. Periodontitis is an inflammation of both soft and hard supporting tissues and characterised by progressive destruction of connective tissue attachment and bone around the teeth over the years (Newman et al., 2018). At the initial stage of chronic periodontitis, individuals may be unaware of their disease and tend to ignore their periodontal condition, as there are no significant symptoms. However, this disease may progress to an advanced stage and create symptoms that affect the quality of life, such as gum recession, pain, bad breath, eating difficulties, tooth mobility, and ultimately tooth loss. These effects of periodontal disease may lead to a negative impact on an individual's well-being, such as constrained food choice, impaired communication, and low self-esteem (Cunha-Cruz et al., 2007, Petersen and Ogawa, 2012).

Periodontal disease has been described as the second most important global oral disease burden after dental caries (Petersen and Ogawa, 2012). Mild to moderate periodontitis is almost universally prevalent in adults (Kassebaum et al., 2014). Furthermore, it is estimated that periodontal disease has affected more than 750 million people which makes this disease as the 11th most prevalent disease worldwide based on the Global Burden of Disease Study in 2016 (GBD 2016 Disease and Injury Incidence and Prevalence Collaborators, 2017).

Figure 1.1 gives an overview of the burden of tooth loss and mouth/teeth problems among older people (65-74 year olds) according to the national income level based on the World Health Survey. There were about 25% older people with no natural teeth, which means there were 75% older people who still have their natural teeth, and 35% of the total elderly population reported

having problems with their mouth/teeth. This proportion is even worse in low-income countries, although there were 90% older people retain their natural teeth, more than 40% of the elderly population reported having problems with their mouth/teeth (Petersen et al., 2010, Petersen and Ogawa, 2012).

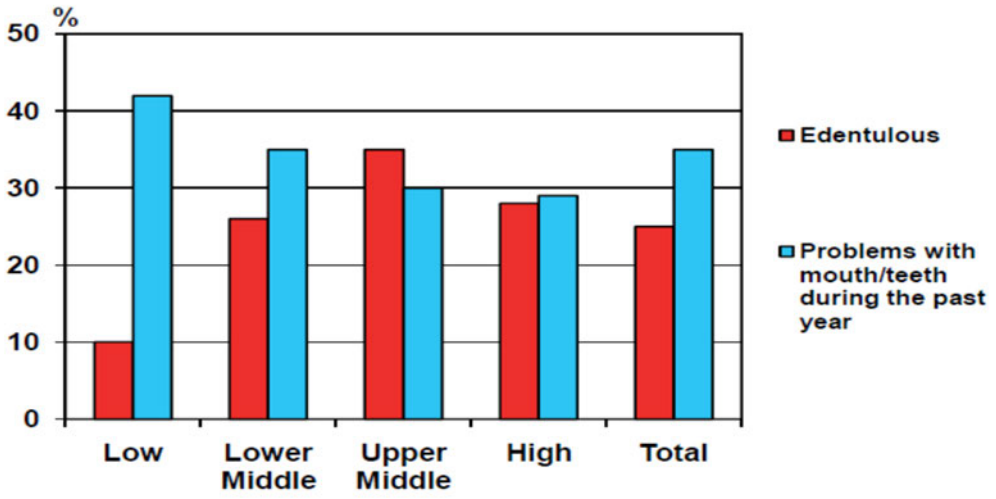

Figure 1.1 Percentage of 65 to 74 year old elderly with no natural teeth and percentage of elderly who have problems with their oral health according to the national income level based on the World Health Survey (Petersen and Ogawa, 2012).

Periodontal disease experiences and prevalence could be different in poor, developing, and developed countries due to differences in social condition and expectations and different patterns of access to oral health care (Petersen and Ogawa, 2012).

Indonesia is a developing economy country and the fourth most populous country in the world. There were more than 265 million of people living in Indonesia based on the recent publication in 2019 (Badan Pusat Statistik Indonesia, 2019). As with many other developing countries in Asia, Indonesia has witnessed population ageing and a growing number of older people. More than half of its population (54%) lives in urban areas (The World Bank, 2014). Indonesian life expectancy at birth has increased from 50 years (female) and 47 years (male) in 1960 to 71 years (female) and 67 years (male) in 2015 (The World Bank, 2019a, The World Bank, 2019b). The details about Indonesian life expectancy are shown in Figure 1.2.

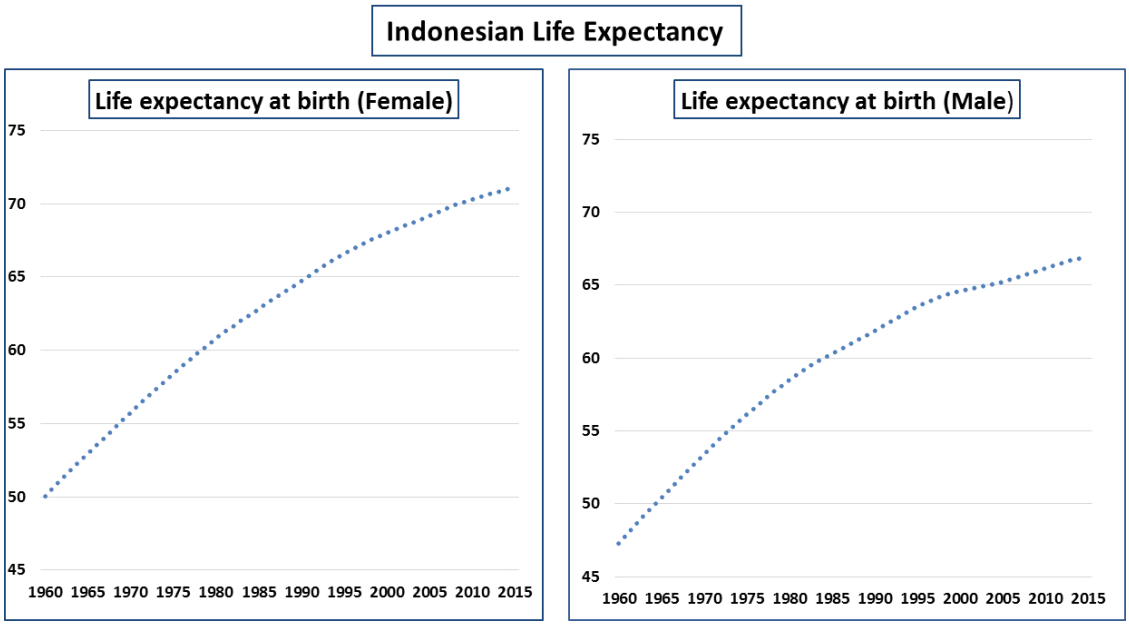

Figure 1.2 Indonesian life expectancy at birth (female and male) has increased gradually since 1960 to 2015 (The World Bank, 2019a, The World Bank, 2019b).

The background of this research is Depok, which is an administrative city on the southern border of the capital city of Indonesia (Jakarta) and located in the West Java province. Indonesia is divided into 34 province and West Java province has been the most populous province in Indonesia, with the latest figure in 2018 was 48,683,700. This province accounts for 18.37 % from Indonesia total population (Badan Pusat Statistik Indonesia, 2019). Depok as a buffer zone of the capital city, has various urban issues, including increasing population migration from rural areas and other urban areas. In addition to this, Depok has seen the growing number of older people. It is projected that the population of 50 years and above will reach 538,400 people by the 2025, which accounted for 19.5 of Depok projected population in 2025 (Badan Pusat Statistik Provinsi Jawa Barat, 2019).

The perceived need for dental and oral health utilisation in older adults is determined by their physical condition, psychological state, social context, and point of view about the importance of oral health care (Griffin et al., 2012).

Investment in maintaining oral health in developing countries is considered lower than in developed countries. Although severe oral disease, including severe periodontitis, can be avoidable with preventive care and early treatment, the focus of oral health care and treatment in many developing countries are still in the curative care, such as emergency oral treatment and pain relief (Petersen et al., 2005a).

Recent systematic review studies underline the negative impact of periodontal disease on quality of life. These reviews have assessed previous quantitative research regarding the impact of periodontal disease on well-being (Buset et al., 2016a, Ferreira et al., 2017a). However, only a few qualitative studies were done to understand personal periodontal disease experiences and the extent of this disease to people's quality of life, especially in the context of a developing world.

Previously, oral health studies in Indonesia have been focused mainly on dental caries, while less attention has been given to periodontal disease. Furthermore, few qualitative studies have explored the association between periodontal disease and quality of life globally, particularly in the context of a developing country (Buset et al., 2016a, Ferreira et al., 2017a). To our knowledge, there is no quantitative and qualitative study which focuses on the effect of periodontal disease experiences on quality of life with Indonesian older people as a background to the present date. Therefore, this mixed-methods study attempt to fill the gap of knowledge in understanding the impact of periodontal disease on quality of life, focusing on the older people population.

This study provides detailed information about periodontal disease in the ageing Indonesian population. Furthermore, the study investigates the impact of periodontal disease on an individual's quality of life as a reflection of a person's subjective experience in relation to periodontal disease and their progression. This study was undertaken using a sample from the population of Depok as a representative urban population in this developing country.

1.2 Aim of the study

The overall aim of this PhD research is to examine the relationship between quality of life and periodontal disease in the ageing population in Indonesia as well as understanding their personal experiences with periodontal disease.

1.3 Objectives

The specific objectives of the PhD are:

1. To investigate the relationship between oral health-related quality of life and periodontal diseases in the urban ageing population in Indonesia. Periodontal disease was evaluated clinically and subjectively to search for evidence of its impacts on participants' oral health-related quality of life. The quantitative study to achieve this first objective is presented in Chapter 5.

2. To explore and understand the relationship identified by the quantitative outcomes using semi-structured interviews as a qualitative research instrument. Generate an understanding of the relationship between quality of life and periodontal disease in the urban ageing population based on their personal experiences, attitudes, and behaviour toward periodontal disease in the natural setting. The qualitative study to reach this second objective is given in Chapter 6.

3. To provide comprehensive findings of the impacts of periodontal disease and oral health-related quality of life of the urban older population in Indonesia through the quantitative and qualitative data integration. The mixed-methods approach of data integration is presented in Chapter 7.

1.4 Research conceptual framework

The conceptual framework of this PhD research project is shown in Figure 1.3. The figure illustrates the possible relationships between potential risk factors (socioeconomic, demographic, behavioural factors, and oral health condition)

and oral health-related quality of life. This conceptual model was original work but built on the previous literature and conceptual model of health-related quality of life, particularly the Wilson and Cleary health-related quality of life conceptual model. The details regarding the Wilson and Cleary model can be found on pp. 21 - 23.

Symptoms status and functional status described in the Wilson and Cleary model was assessed through teeth and periodontal condition examination. Socio-economic and demographic variables were used to acknowledge the possible influence of the characteristics of the individual on the OHRQoL. The semi-structured interview was used to explore and understand participants' subjective experience periodontal disease experiences. Furthermore, the interview was also used as an exploration of the environment characteristics, which potentially affect the overall OHRQoL.

This study uses a mixed-methods design with both quantitative and qualitative data collection instruments. In the quantitative phase, a clinical examination and questionnaire which include the short form of Oral Health Impact Profile-14 (OHIP-14) were used as data collection instruments. The OHIP is a validated measurement of oral health-related quality of life. The OHIP gives an overview of older people's self-perception of oral disease and their daily life functioning.
In the qualitative phase, the participants were led through a semi-structured interview. The qualitative data is used to expand the quantitative findings.

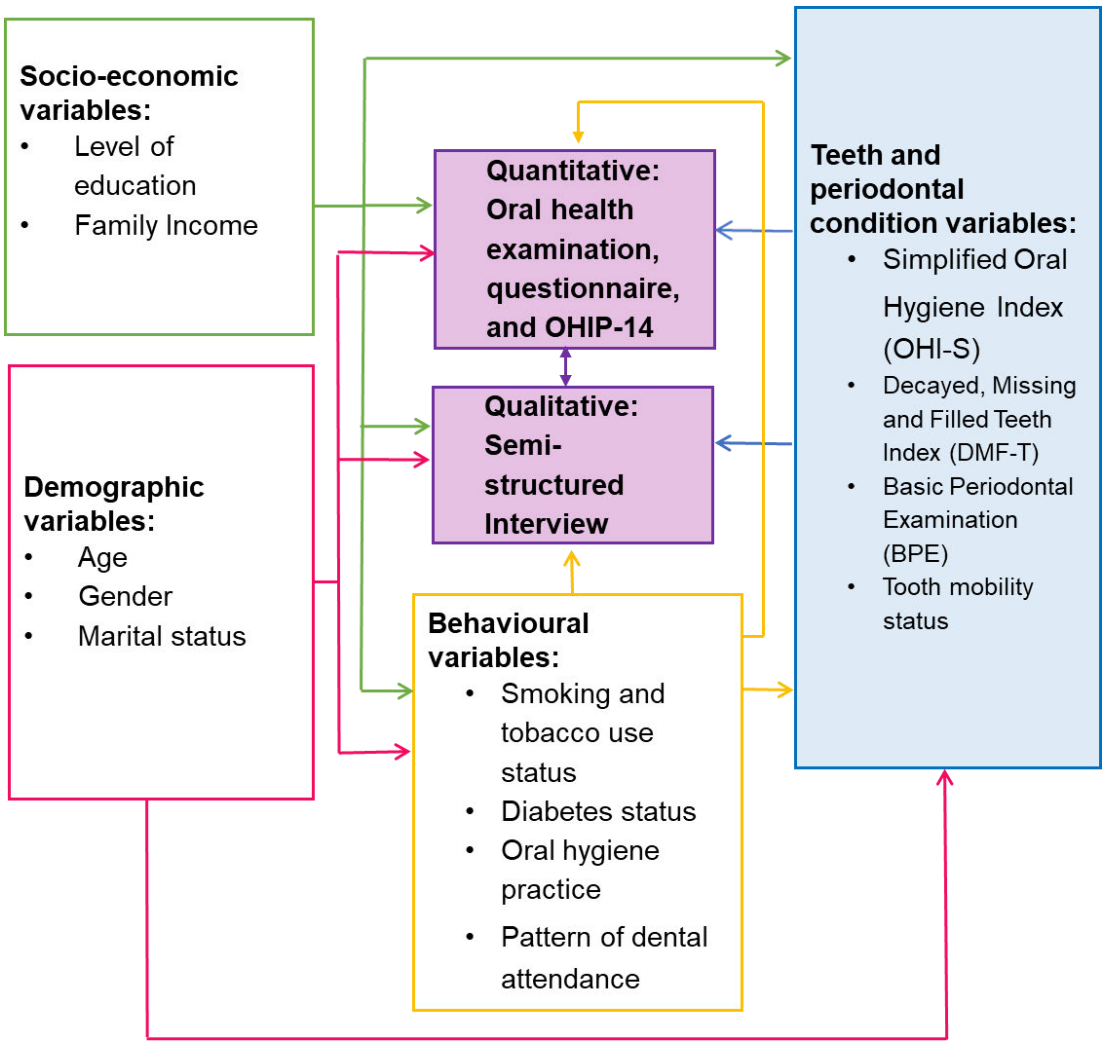

Figure 1.3 Conceptual Framework of the PhD research.

1.5 Overview of the methodological approach

There were three complementary data collection conducted in this study, which involved pilot study, quantitative data collection, and qualitative data collection. The experimental design was a *sequential explanatory*, where a quantitative data collection phase was followed by a qualitative data collection phase (Andrew and Halcomb, 2009). First, a pilot study was conducted as a part of the development of the research instruments (a structured questionnaire and interview topic guide), and to assess the effectiveness and appropriateness of the questions in the instruments prior to the data collection

in Indonesia. Secondly, the quantitative data collection, which involves questionnaire completion and an oral health examination, was conducted on a sample of urban older people in Depok, Indonesia. Then, participants for qualitative data collection were selected based on their periodontal condition, gender, age, and level of education to be interviewed. The information about participants' periodontal condition and gender were obtained from the quantitative data collection.

The research data collection stages in Indonesia are illustrated in Figure 1.4.

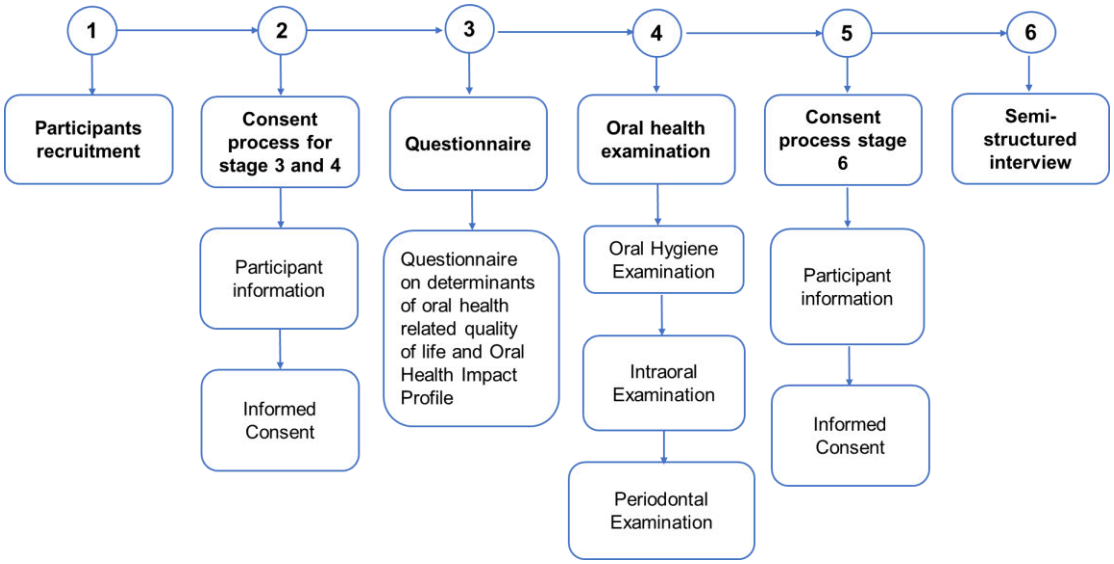

Figure 1.4 Research data collection stages for the data collection in Indonesia

Stage 1: Participants' recruitment

Stage 2: Consent process for participants to participate in quantitative data collection (Stage 3 and 4). This data collection phase involves both questionnaires completion and an oral health examination. Participants have received information about the nature of the study, risks and benefits, and confidentiality. If participants agree to contribute to the study, then they should complete and sign the consent form.

Stage 3: Questionnaire completion.

Stage 4: Oral health examination which consists of assessing quality of oral hygiene, an intraoral examination, and a periodontal examination. The oral health examination and questionnaire completion were held on the same day.

Stage 5: Participants were selected based on their periodontal examination results, gender, age, and level of education to participate further in this study as interviewees. Participants who were willing to contribute as interviewees received information about the interview, risks and benefit, and confidentiality. If participants agree to be involved in the semi-structured interviews, then they would complete and sign the relevant consent form.

Stage 6: Semi-structured interviews conducted.

In the event that a participant withdrew from the study prior to completion of all stages, we were, with the consent of that individual, use the data that we gathered from them in our analysis.

1.6 Outline of the thesis

The contents summary of the individual chapters is briefly outlined below.

- Chapter 1 is an introduction to give an overview of the PhD research background.
- Chapter 2 summarise the existing literature on oral health-related quality of life and more specifically on periodontal disease and quality of life. This chapter also presents the knowledge gaps identified from the literature review regarding the periodontal disease and quality of life.
- Chapter 3 presents data collection instruments which include a structured questionnaire, interview topic guide, and oral health examination. The details about participants and sampling design, calibration between the dental examiners, and both quantitative and qualitative methodology are also presented in this chapter.

- Chapter 4 gives details about the development of the questionnaire and the interview topic guide. Furthermore, the research pilot which was done prior to the data collection in Indonesia can be found in this chapter.

- Chapter 5 presents quantitative research findings regarding the periodontal status of the urban older population in Depok and their quality of life which was evaluated through the OHIP. The discussion, strengths and limitations of the study, and conclusion about the findings are also presented in this chapter.

- Chapter 6 reports the qualitative research findings regarding the perceived impact of periodontal disease based on urban older population subjective experiences. This chapter also provides the discussion, strengths and limitations of the study, and conclusions of the findings.

- Chapter 7 provides comprehensive findings of a mixed-methods approach of the impacts of periodontal disease on oral health-related quality of life of the urban older population in Indonesia through the integration of the quantitative and qualitative data results. This chapter also presents the strengths and limitations of the mixed-methods study and conclusions.

- Chapter 8 presents the conclusion of the works that have been done, recommendations for future works, and challenge and opportunities to overcome the burden of periodontal disease in Indonesia.

Chapter 2 Literature review

2.1 Overview of global population ageing and periodontal disease

Improvements in health prevention and treatment of diseases allow individuals to have a longer life expectancy. World life expectancy has significantly risen from 54 years (female) and 50 years (male) in 1960 to 74 years (female) and 70 years (male) in 2017 (The World Bank, 2019a, The World Bank, 2019b). The illustration of the increasing global life expectancy is shown in Figure 2.1.

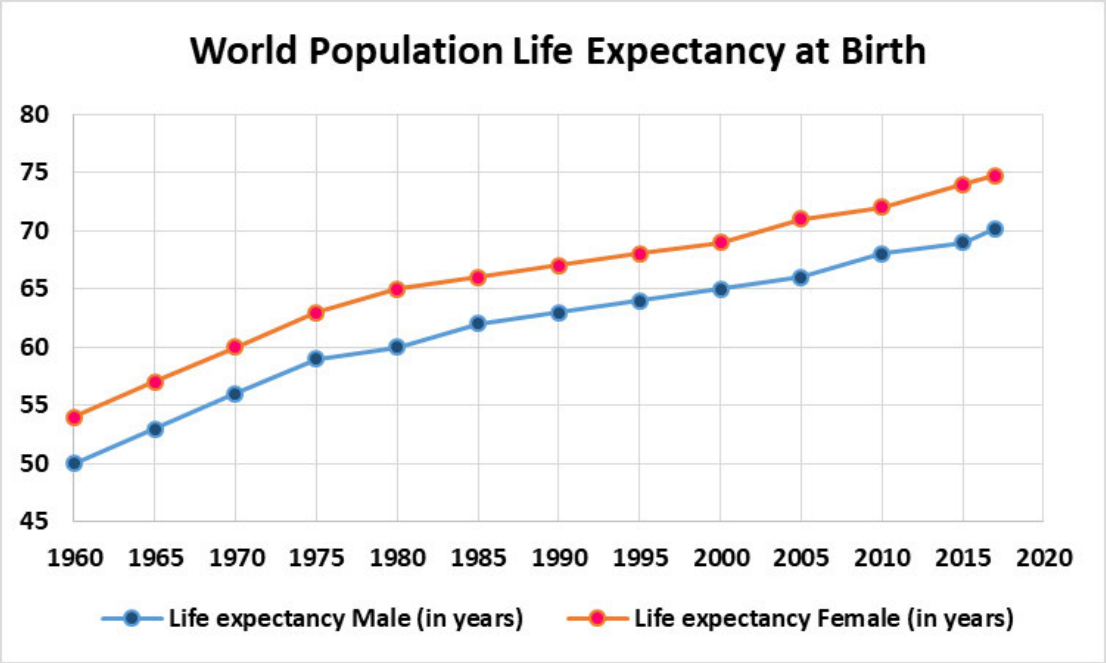

Figure 2.1 The world population life expectancy at birth in years (female and male) has increased gradually since 1960 to 2017 (The World Bank, 2019a, The World Bank, 2019b).

Globally the proportion of older people in the world's population is increasing rapidly. The United Nation (UN) has projected that the number of older people, aged 60 years and above, worldwide will reach nearly 2.1 billion by 2050. This means it is expected that the size of the world's population over the age of 60 will have doubled since 2017, when it was estimated at around 962 million. The projections for the proportion of older people varies with regions of the

world. So in Europe, it will be around 35% by 2050 whereas the projections for other regions are Northern America 28%, Latin America and the Caribbean 25%, Asia 24%, Oceania 23%, and Africa 9%. Around two-thirds of the world's older population of older people will be living in developing countries (United Nations, 2017).

An increase in life expectancy and a growing number of older people are not without problems. The risk of non-communicable chronic diseases (NCDs) increases with age and may lead to a decrease in older people's quality of life. In parallel with the increasing numbers of older people, there is a global trend for more of them to have some natural teeth rather than being edentulous. This will lead to higher demand from older individuals for dental and periodontal care in order to retain their masticatory function and well-being (Needleman, 2012).

Dental caries and periodontal disease have been described as the two major global burdens of oral health disease (Petersen et al., 2005a). It is estimated that 90 per cent of the world's population have experienced some forms of oral disease and discomfort at some points in their life. Oral disease has contributed to the burdens of negative impacts on daily lives and economic development aspects, which indicated by the loss of millions of school and work hours yearly around the world (Jin et al., 2016).

Despite being acknowledged as one of the major burdens of oral disease, fewer dental public health efforts have focussed on periodontal disease prevention and management compared with dental caries. This can be seen by fewer public health activities to promote periodontal disease awareness, limited evidence of population surveillance in relation to the prevalence of periodontal disease, and monitoring the groups who may have more risk of having an advanced progression of periodontal disease (Dye, 2012). In addition to this, there are very few of periodontal disease epidemiological studies with national representative samples (Dye, 2012, Kassebaum et al., 2017).

Periodontal disease as a chronic disease is highly prevalent worldwide and universally prevalent in adults (Petersen and Ogawa, 2012, Kassebaum et al., 2014). Previous research has been suggested that age is an associated factor for periodontal disease (Newman et al., 2012). The burden of periodontal disease alongside with other oral health problem has a significant negative impact on older people's quality of life, including daily function, psychological and social well-being (Petersen et al., 2005a). Pain, eating difficulty, constrained food choice, bad breath, and reduced self-confidence have been reported as adverse effects of chronic periodontal disease (Petersen and Ogawa, 2012, Cunha-Cruz et al., 2007).

2.1.1 Global burden of periodontal disease

It is estimated that the worldwide prevalence of untreated caries, severe periodontitis, and tooth loss impacted around 3.9 billion of the global population by 2010 (Jin et al., 2016, Marcenes et al., 2013). The global burden of oral disorders has increased by 20.9 per cent from 1990 to 2010 (Murray et al., 2012). Previous studies indicated that the global burden of periodontal disease increased by 57.3 per cent from 1990 to 2010 (Tonetti et al., 2017, Jin et al., 2016, Murray et al., 2012). Figure 2.2 gives details regarding the global burden of major oral diseases and conditions in 1990 and 2010.

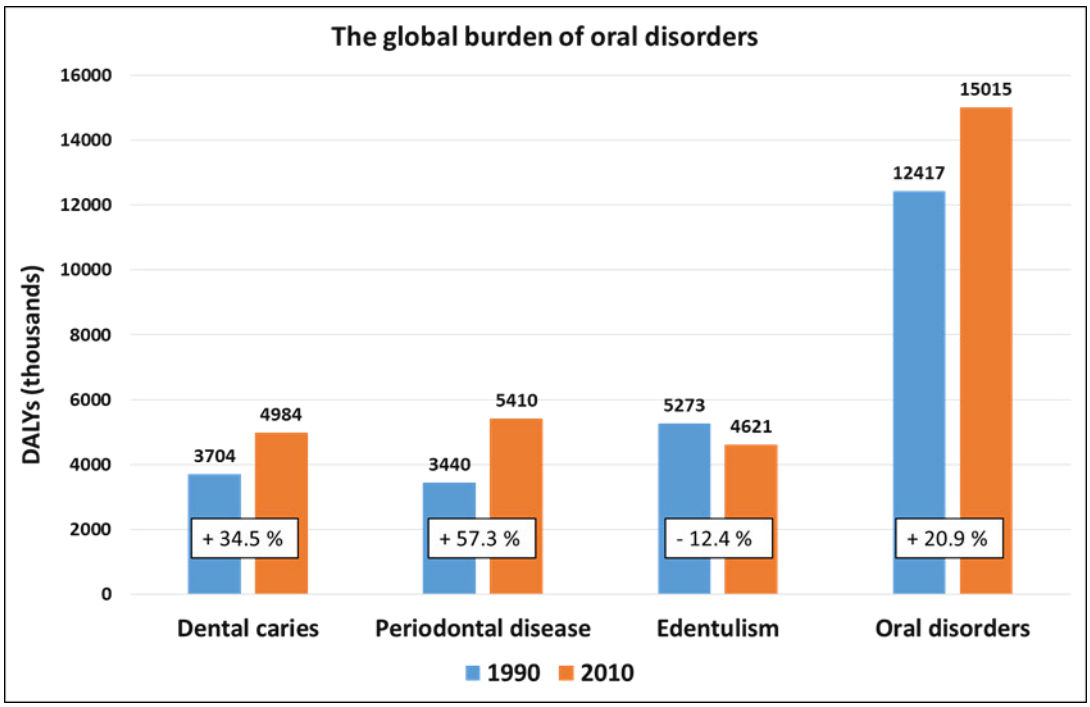

Figure 2.2 The global burden of oral disorders which include major oral diseases (dental caries and periodontal disease) and oral condition (edentulism) measured by the disability-adjusted life years (DALYs x 10^3). The overall global burden of oral disease increased by 20.9 per cent from 1990 to 2010. The global burden of periodontal disease and dental caries increased dramatically by 57.3% and 34.5%, respectively. On the other hand, the global burden of edentulism decreased by 12.4 per cent from 1990 to 2010. Data are extracted from Murray et al. (Murray et al., 2012).

Periodontal disease has been acknowledged as posing the second most important global oral disease burden after dental caries (Petersen and Ogawa, 2012). It is estimated that periodontal disease affected more than 750 million people globally in 2016. Moreover, periodontal disease was the 11th most prevalent disease worldwide among 328 diseases and injuries based on the Global Burden of Disease Study in 2016. The Global Burden of Disease in 2016 also found periodontal disease was the 7th most prevalent non-communicable disease worldwide (GBD 2016 Disease and Injury Incidence and Prevalence Collaborators, 2017).

Dental caries and periodontitis are the leading cause of the tooth loss for all the age-groups globally. Particularly, chronic periodontitis is the dominant cause of tooth loss in adults in both developed and developing countries (Jin

et al., 2016, Jin et al., 2011, Pihlstrom et al., 2005). Individuals with an advanced progression of periodontal disease are estimated to have a higher risk of multiple tooth loss which may lead to problems with masticatory function, social interactions, and self-esteem. Furthermore, this disease may also introduce burdens in terms of socioeconomic impacts and oral health care costs. These burden of periodontal disease may potentially reduce people's quality of life (Tonetti et al., 2017, Jin et al., 2016, Chapple, 2014, Petersen and Ogawa, 2012, Cunha-Cruz et al., 2007).

Despite the possible impact of periodontitis on quality of life, public health awareness regarding periodontal disease is still considered as low. This can be seen by the passive action to prevent periodontal disease. Furthermore, a lack of awareness of periodontal disease consequences may lead to failure to overcome early symptoms of periodontal disease. In addition to this, there is also a lack of awareness regarding the progression of periodontal disease and its possible irreversible effect due to a lack of effective oral health promotions regarding this disease (Jin et al., 2011).

2.2 Oral health services in Indonesia

Health services facilities in Indonesia consist of public (government) and private hospitals, community health centres, private clinics, midwife practices, and *Posyandu*. Oral health services are provided by both public and private hospitals, community health centres, and some of the private clinics (Badan Penelitian dan Pengembangan Kesehatan, 2013a).

Community health centres are government-mandated health facilities which provide first-level of health treatment, promotion, and prevention. Health services provided by the community health centres include general health services, dental health services, midwifery, and pharmacy. This type of health facility is designed to be local and provide health care services on a sub-district level. Indonesia had 9,825 community health centres by 2017, which located across 34 provinces in Indonesia. Papua, Papua Barat, and North Kalimantan

provinces had the lowest ratios of the availability of the community health centres, which were 0.7, 0.71, and 0.92, respectively. These ratios illustrate that the ideal ratio of at least one community health centres per sub-district had not been fulfilled in the three provinces mentioned above. Jakarta, as the capital of Indonesia, had the highest ratio of the community health centres, 7.73 per sub-district. While 30 other provinces, had ratios availability of the community health centre per sub-district around 1.06 to 2.11 (Kementerian Kesehatan Republik Indonesia, 2018).

There are two types of private clinics in Indonesia, clinics which provide basic health services and clinics which provide primary and specialist health services. Based on the data from Indonesia Health Profile 2017, there were 8,610 clinics spread across Indonesia, consisting of 7,641 primary health services clinics and 969 specialist clinics. Four provinces in Indonesia did not have any specialist clinics (North Kalimantan, West Sulawesi, North Maluku, and Gorontalo provinces). Jakarta had the highest number of specialist clinics with 207 specialist clinics. Central Java province had the highest number of primary health services clinics with 919 clinics, and North Kalimantan had the lowest number of the primary clinic with only one clinic (Kementerian Kesehatan Republik Indonesia, 2018).

By 2017, there were 864 public hospitals and 1,334 private hospitals across Indonesia. Indonesia has reached the ratio of one hospital bed per 1,000 population since 2013 (Kementerian Kesehatan Republik Indonesia, 2018).

Posyandu (*Pos Pelayanan Terpadu*) is the extension of the community health centres, which carried out health promotion and prevention roles closer to the community. Posyandu is a form of health efforts with community-based resources and located in almost every sub-district in Indonesia. *Posyandu* is run by the community health workers who live in the area served by the *Posyandu*. Community health workers are trained by the health professionals to socialise government health promotion programme. In addition to this, providing the first contact for health information and acting as a mobiliser for the community to implement healthy lifestyles are some of the vital roles of

these community health workers. The main activities in *Posyandu* include baby and toddler vaccinations, body weighing service, blood pressure and diabetes monitoring for older people, family planning programme promotion, socialise prevention and control of diarrhoea, and giving health education to the community (Kementerian Kesehatan Republik Indonesia, 2018).

In 2017, the number of *Posyandu* in Indonesia was 294,428. However, the percentage of *Posyandu* that able to carry out its primary activities routinely at least once in a month was only 57.43 per cent (Kementerian Kesehatan Republik Indonesia, 2018).

Community accessibility toward health facilities was affected by various factors, including the availability of health facilities, accessible transportation in the area, geographical conditions, and the infrastructure progress of the area.

The household awareness toward the availability of health services and its locations are varied with the range percentage between 53.9 to 69.6 per cent (Badan Penelitian dan Pengembangan Kesehatan, 2019). This data reflects a challenge for public health of Indonesia to increase public awareness for the availability of health facilities. The proportion of household awareness of the available health facilities is given in Table 2.1.

Table 2.1 The percentage of Indonesian household who mentioned that they know the availability of health services and its locations based on the type of health services (Badan Penelitian dan Pengembangan Kesehatan, 2013a).

Types of health facilities	Indonesian household awareness of the availability of health services and its locations in percentage (%)
Government hospitals and community health centre	69,6
Private hospitals and clinics	53,9
Midwife practices	66,3
Posyandu and *Posbindu*	65,2

Prior to 2014, Indonesia did not have universal health coverage insurance. There was 50.5 per cent of Indonesian who did not have any health insurance based on the National Basic Health Survey 2013, which means they had to spend out of pocket expenses to receive any health service. On the other hand, there was 49.5 per cent who had various form of health insurance (Badan Penelitian dan Pengembangan Kesehatan, 2013a). The details of the proportions of the population according to health insurance ownership in 2013 are given in Table 2.2.

Table 2.2 The proportion of the Indonesian population according to their health insurance ownership in 2013 (Badan Penelitian dan Pengembangan Kesehatan, 2013a).

Types of health insurance	Descriptions	Percentages of the population according to health insurance ownership (%)
Social health insurances provided by the government	The government provided insurance for those who work in the government sector.	6
Labour social security	Companies provide insurance for labour who work in the private sector.	6.1
Privately own insurance	Privately own insurance	1.7
Public health insurance	The government provides insurance for those who categorised as poor citizens	38.5
No health insurance	Indonesian who did not have any form of health insurance	50.5

A step towards universal health coverage, namely Badan Penyelenggara Jaminan Sosial Kesehatan (BPJS Kesehatan) health insurance, in Indonesia was started in 2014. Member of this health insurance is all Indonesian

residents, including foreigners who have worked for at least six months in Indonesia and have paid health insurance monthly contribution fees. Indonesians categorised and registered as poor people are free from the contribution fees as the government pays the monthly contribution fees for them (BPJS Kesehatan, 2020).

Oral health care services covered by the universal BPJS Kesehatan includes primary oral health services, such as consultation administration fees, medication, oro-dental emergency, deciduous tooth extraction, permanent tooth extraction (for a case without complications), post-extraction medicine, dental fillings, and once in a year scaling (BPJS Kesehatan, 2020). However, scaling as a part of periodontal treatment may not be available for free for all the insurance holder depends on the indications and availability of this treatment in particular health services provider (BPJS Kesehatan, 2020).

Although the BPJS health insurance covers primary oral health treatment and services, 75.6 per cent of Indonesian reported they did not go to the health professional when they had oral health problems (Badan Penelitian dan Pengembangan Kesehatan, 2019). This high figure of those who did not come to health facilities to get dental care and treatment could be explained by the data related to the household awareness of the availability of health services near their local area and the access to the health care facilities. As it has been reported in the previous paragraph above, the household health services awareness was varied with the range percentage between 53.9 to 69.6 per cent. The details regarding the percentage of the household awareness of the availability of the health facilities are presented in Table 2.1 above (Badan Penelitian dan Pengembangan Kesehatan, 2013).

In addition to this, significant proportions of Indonesian reported that the access to health facilities as difficult and very difficult, especially for those who live in the rural areas. The details of Indonesians oral health-care seeking behaviour are presented in Table 2.3, and the details regarding the accessibility of the health facilities are described in Table 2.4.

Table 2.3 Oral health-care seeking behaviour in percentage (Badan Penelitian dan Pengembangan Kesehatan, 2019).

Age group	Oral health-care seeking behaviour (in percentage)						
	Dentist	Specialist dentist	Dental nurse	General practitioner	Unqualified person	Self-care	No treatment
3-4 years	8.3	1	2.1	7	0.2	31.8	49.6
5-9 years	17.8	2	3.7	6	0.4	36.6	33.5
10-14 years	13.5	1.6	3	4.8	0.5	40.2	36.4
15-24 years	13.1	2.6	2.5	4.4	0.9	42.3	34.2
25-34 years	14.5	3	2.8	5.1	1.1	43.8	29.7
35-44 years	15.1	2.6	3.1	5.6	1.4	45.4	26.8
45-54 years	14.4	2.6	2.9	5.4	2	45.3	27.4
55-64 years	12.3	2.2	2.6	5.3	2.5	42.9	32.2
65 years and above	8.8	1.9	2.1	4.3	2.5	37.8	42.6
Indonesia	13.9	2.4	2.9	5.2	1.3	42.2	32.1

Table 2.4 The accessibility of health facilities in urban and rural areas based on Indonesian households subjective assessment (Badan Penelitian dan Pengembangan Kesehatan, 2019).

Type of health facilities	Ease of access based on household subjective assessment		
	Easy (%)	Difficult (%)	Very difficult (%)
Government and private hospital			
• Urban	53.9	32.8	13.3
• Rural	14.6	42.4	43.0
Community health centre/ Midwife practice			
• Urban	46.1	31.5	22.5
• Rural	31	32.2	36.8
Private clinic/ private dental practice/ Private midwife practice			
• Urban	39.1	31.5	29.5
• Rural	34.9	30.7	34.4

2.3 Oral health-related quality of life (OHRQoL)

2.3.1 Definition of oral health

World Health Organisation (WHO) has emphasised the importance of oral health as a critical indicator of overall health, well-being, and quality of life in their world oral health report. There is a strong relationship between oral and general health; for instance, periodontal disease has an association with diabetes (Petersen and WHO Oral Health Programme, 2003). In addition to this, several oral diseases and other chronic NCDs share the same common risk factors of sugars, smoking and alcohol consumption (Jin et al., 2016).

Oral health is an integral part of our general health and well-being. Oral health is defined as a state of oral normal function which enables an individual to undertake normal everyday activities (such as eating, speaking, smiling, and socialising) without chronic oral pain, oral and throat cancer, oral infection and sores, periodontal disease, tooth decay, tooth loss, and other oral diseases and disorders (Petersen and WHO Oral Health Programme, 2003, Daly et al., 2013).

Oral diseases contribute to the global burden of diseases as the most common non-communicable diseases (NCDs) which affected people throughout their life, causing pain, discomfort, disfigurement, and even death (GBD 2016 Disease and Injury Incidence and Prevalence Collaborators, 2017). Although oral health problems may influence people's social life and their quality of life, the relationship between the oral health condition and quality of life is not always straightforward, as it is can be affected by people's subjective perceptions, expectations, standards, concerns, and behaviours in defining the association between health and quality of life (Locker, 1997, Sischo and Broder, 2011).

2.3.2 Conceptual model of oral health-related quality of life

One of the most noticeable conceptual models of health-related quality of life was developed by Wilson and Cleary. The model describes the relationship

between clinical conditions (biological and physiological) and well-being. This model begins by explaining that biological and physiological conditions have a close association with disease symptoms. The disease symptoms include any abnormality in physical, psychophysical, and emotional states. These symptoms may influence an individual's physical function, social role, and psychological function. Furthermore, the disturbance of a functional condition could affect a person's general health perception, which finally may influence their quality of life. Characteristics of the individual and the environment have impacts on an individual's disease symptoms, functional status, general health perceptions, and overall quality of life (Costa and King, 2013, Wilson and Cleary, 1995). The Wilson and Cleary health-related quality of life conceptual model is shown in Figure 2.3.

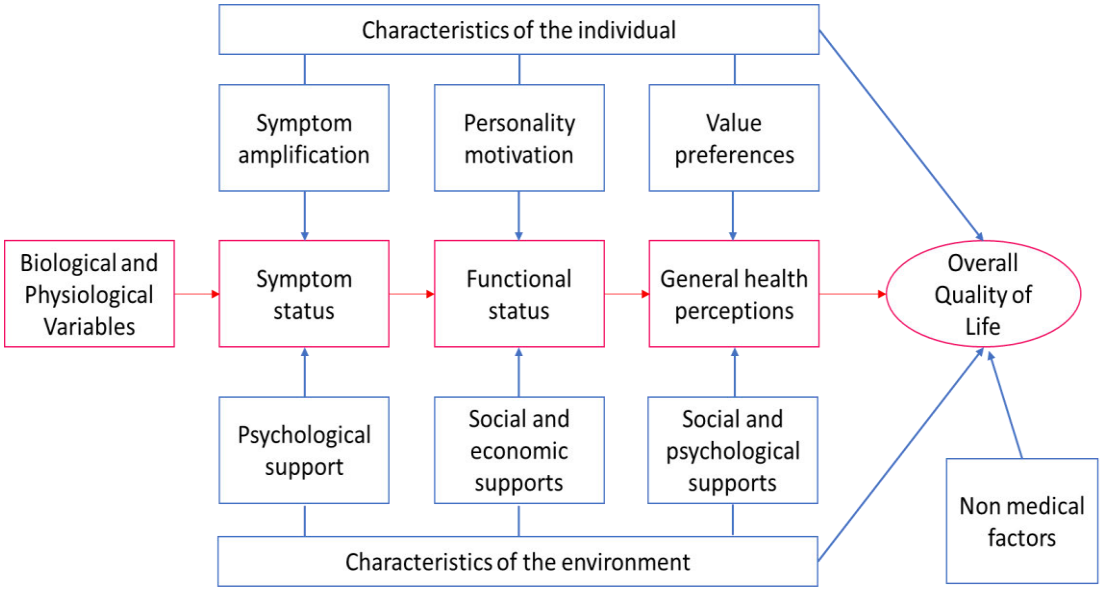

Figure 2.3 The Wilson and Cleary health-related quality of life conceptual model (Costa and King, 2013, Wilson and Cleary, 1995).

A conceptual model of oral health-related quality of life developed by Locker explains that oral health condition is not only seen as a disease status but also involves physical functional, psychological, and social aspects (Daly et al., 2013, Baker, 2007, Slade, 1997a).

There are five components in this conceptual model: impairment, functional limitation, discomfort/pain, disability, and handicap. These components are

sequentially related. Impairment results in a restriction in the body functions, discomfort, and pain, which could lead to disability in physical, psychological, and social life. Furthermore, the disability condition can lead to handicap, a condition where a person could not conform to the social group expectations. Impairment and functional limitation may also lead directly to handicap (Daly et al., 2013).

Locker's proposed conceptual model of oral health is illustrated in Figure 2.4.

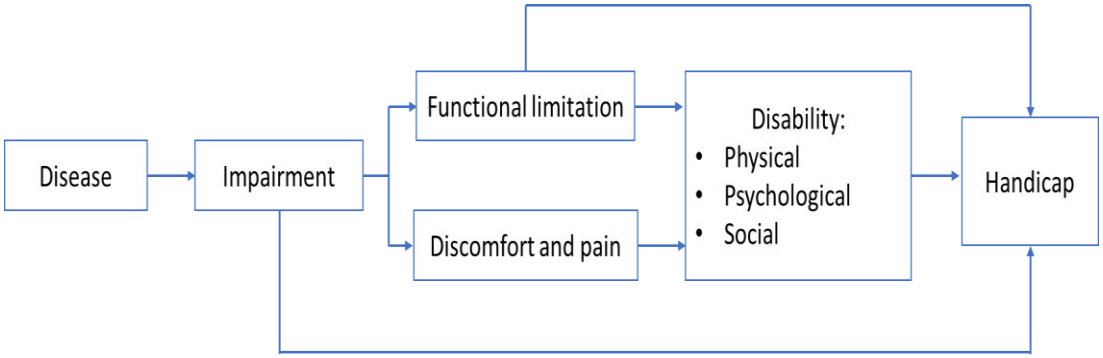

Figure 2.4 Locker's conceptual model of oral health (Locker, 1988, Slade, 1997a, Daly et al., 2013).

2.3.3 Measuring oral health and quality of life

There are several existing measurement instruments to assess oral health-related quality of life (OHRQoL). These measurements give information about people's perceived need for dental treatment, perceptions about the results of dental treatment, and a measure of the effect of oral health conditions on well-being (Daly et al., 2013). As a participant-based outcome measure (PBOs), assessment of the oral health-related quality of life has become an important part of dental research in documenting patient's self-perception of oral disease and normal life functioning (Locker, 1997).

The aim of oral health and quality of life measurement is to assess needs for dental care, outcomes of clinical dental treatments, and as an epidemiological tool to measure the impact of oral diseases on quality of life (Tsakos et al., 2012). Table 2.5 gives a summary of existing OHRQoL instruments.

Table 2.5 Summary of existing OHRQoL instruments and its dimensions.

No	Name of the instruments	Dimensions of the instrument
1.	Social Impacts of Dental Disease (SIDD) (Sheiham et al., 1996).	*5 dimensions:* Eating restrictions, communication restrictions, pain, discomfort, and aesthetic dissatisfaction.
2.	Rand Dental Questions (Dolan and Gooch, 1996).	*3 dimensions:* pain, worry, and concern with social interactions.
3.	Geriatric Oral Health Assessment Index (Atchison, 1996).	*3 dimensions:* physical function, psychosocial function, and pain or discomfort.
4.	Dental Impact Profile (DIP) (Strauss, 1996).	*4 dimensions:* eating, health/well-being, social relations, and romance.
5.	Oral Health Impact Profile (OHIP) (Slade, 1996).	*7 dimensions:* functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap.
6.	Subjective Oral Health Status Indicators (Locker, 1996).	*8 dimensions:* limitation in chewing, problem speaking, oral pain, other oral symptoms, eating, communication/ social relations, activities of daily living, and worry/concern.
7.	Oral Health Related Quality of Life- UK (OHQoL-UK©) (Bedi and McGrath, 2002).	*16 dimensions:* comfort, breath, general health, eating, appearance, speech, relax/sleep, smiling/laughing, confidence, mood, carefree manner, personality, work, social life, finances, and romantic relationships.
8.	Dental Impact on Daily Living (Leao and Sheiham, 1996)	*5 dimensions:* comfort, appearance, pain, performance, and eating restriction.

Table 2.5 continued

No	Name of the instruments	Dimensions of the instrument
9.	Oral Health Quality of Life Inventory (OH-QoL) (Cornell et al., 1996).	*4 dimensions:* oral health, self-report assessments of oral health and functional status, nutrition quality of life index, and an interview version of the quality of life inventory.
10	Oral Impacts on Daily Performances (Adulyanon and Sheiham, 1996).	*Performances in 8 daily activities:* Eating and enjoying food; speaking and pronouncing clearly; cleaning teeth; sleeping and relaxing; smiling, laughing and showing teeth without embarrassment; emotion; social role; enjoying contact with people.

2.3.3.1 Overview of the Oral Health Impact Profile (OHIP)

The Oral Health Impact Profile (OHIP) was developed as a self-assessment tool to measure the relationship between oral health and quality of life. OHIP as a PBOs instrument is intended to complement the assessment of clinical examination of the disease by providing information about participant's/ patient's subjective assessment of the impact of their oral health on their quality of life. In addition to this, OHIP as an instrument can also be used to assess the effectiveness of health services/ treatment in reducing the burden of the disease on quality of life with sequential measurement before and after an intervention (Slade, 1997b).

The OHIP focuses on impairment and three functional limitation dimensions (physical, psychological, and social). The impacts measured in the OHIP are adverse negative outcomes of the disease. Thus this instrument does not design to assess any positive aspects of oral health (Slade, 1997b).

The first step of OHIP development was identifying a conceptual model of oral health which defined relevant dimensions of impact on an individual's well-being. The OHIP was developed based on Locker's conceptual model of oral

health previously described in the section *2.2.2* of this Chapter. Seven conceptual dimensions derived from Locker's model were used to assess oral health: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap (Slade, 1997b).

The next step of OHIP development was interviewing a convenience sample which consists of 64 dental patients in public and private dental care settings in Adelaide, Australia. The aim of this interview was to identify statements which have a relation with oral conditions effects on well-being. There were a total of 535 statements produced by the interviews using open-ended questions. Forty-six unique statements were derived from the 535 statements and categorised into seven conceptual dimensions. In addition to this, three statements were adapted to the handicap dimension. As a final result, the 49 statements were transformed into 49 questions (Slade, 1997b).

Participants of the OHIP questionnaire are asked about how frequently they had experienced the impact of oral condition to their well-being within a period of 12 months. Furthermore, participants should give an answer for each problem in seven OHIP dimensions based on five-point Likert scale and coded: never (0), hardly ever (1), occasionally (2), fairly often(3), and very often (4) (Slade, 1997a, Slade, 1997b).

OHIP-49 has been used in may research settings to provide comprehensive data about participant's/patient's subjective perceptions of the impact of their disease on quality of life. However, there was a challenge to use the OHIP-49 in some research settings as the questionnaire is quite lengthy. Thus, OHIP-14 was derived and validated from the OHIP-49 as a short form of the OHIP to respond to growing demands of more concise and efficient OHRQoL instrument. This OHIP-14 contains 14 questions which retained the original seven dimensions of the OHIP-49. The OHIP-14 consists of 2 questions in each dimension of the OHIP's seven dimensions. As in the OHIP-49, respondents are asked to indicate a five-point Likert scale as the answer to how frequently they experienced each problem within a reference period of 12

months. The scoring codes is also similar to the original OHIP-49 (Slade, 1997a).

OHIP is one of the most widely known OHRQoL instruments (Ferreira et al., 2017b). It has been used and validated through cross-cultural adaptation in many languages to assess the relationship between oral health and well-being. Table 2.2 gives a summary of the cross-cultural adaptation of the OHIP in various languages. The data in the table is extracted from the Macentee and Brondani's systematic search of the OHIP cross-cultural validation (Macentee and Brondani, 2016). In addition to this, more recent publications regarding the OHIP cross-cultural validation is also added to table 2.6.

Table 2.6 Cross cultural validation of the OHIP in various languages worldwide.

No	Languages (Source of references)	Number of questions in the translated OHIP	
		OHIP-49	OHIP-14
1	Albanian (Bimbashi et al., 2012)	✓	
2	Arabic-Saudi Arabian (Al-Jundi et al., 2007)	✓	
3	Arabic- Lebanese (El Osta et al., 2012)		✓
4	Brazilian–Portuguese (Pires et al., 2006)	✓	
5	Burmese (Soe et al., 2005)		✓
6	Chinese-Cantonese (Wong et al., 2002)	✓	✓
7	Chinese–Mandarin (Liu et al., 2012)	✓	✓
8	Chinese–Taiwanese (Kuo et al., 2011)	✓	✓
9	Croatian (Petricevic et al., 2009, Rener-Sitar et al., 2008)	✓	✓
10	Dutch (van der Meulen et al., 2008)	✓	
11	French Canadian (Allison et al., 1999)	✓	

Table 2.6 continued (1)

No	Languages (Source of references)	Number of questions in the translated OHIP	
		OHIP-49	OHIP-14
12	Georgian (I Kachkachishvili, 2013)		✓
13	German (John et al., 2006, John et al., 2002)	✓	✓
14	Greek (Papagiannopoulou et al., 2012)		✓
15	Hebrew (Kushnir et al., 2004)		✓
16	Hindi (Verma and Sharma, 2019)		✓
17	Hungarian (Szentpétery et al., 2006)	✓	
18	Italian (Corridore et al., 2013)		✓
19	Japanese (Ikebe et al., 2004, Ide et al., 2006, Yamazaki et al., 2007)	✓	✓
20	Korean (Bae et al., 2007)	✓	✓
21	Latvian (Pugaca et al., 2014)	✓	
22	Macedonian (Kenig and Nikolovska, 2012)	✓	
23	Malaysian (Saub et al., 2005, Saub, 2004, Saub et al., 2007)	✓	✓
24	Maltese (Santucci et al., 2014)		✓
25	Persian (Motallebnejad et al., 2011)		✓
26	Romanian (Slusanschi et al., 2013)		✓
27	Russian (Pugaca et al., 2014)	✓	
28	Sinhalese (Ekanayake and Perera, 2003)		✓
29	Slovenian (Rener-Sitar et al., 2008, Rener-Sitar et al., 2009)	✓	✓
30	Spanish (Montero-Martin et al., 2009)		✓

Table 2.6 continued (2)

No	Languages (Source of references)	Number of questions in the translated OHIP	
		OHIP-49	OHIP-14
31	Spanish-Chilean (Lopez and Baelum, 2006)	✓	✓
32	Swedish (Larsson et al., 2004)	✓	
33	Turkish (Mumcu et al., 2006)		✓
34	Vietnamese (Anneloes et al., 2012)		✓

Interpreting OHIP data

All the PBO measurements used in dentistry result in a numerical score. In terms of analysis of severity of impact, the most common practice is to sum the numerical codes of response options of the questionnaire items (Tsakos et al., 2012).

In calculating the scoring formats of the OHIP, three estimations can be calculated, which are the estimates of prevalence, extent, and severity of the impact on the quality of life. Prevalence of the impact refers to the proportion of individuals who reported one or more OHIP's items as "fairly often" or "very often". The extent of the impact refers to the number of OHIP items experienced 'fairly often' or 'very often'. There are 14 items in the OHIP questionnaire. The range of the total extent of impacts may vary from 0 to 14. While the severity of the impact is the overall OHIP score (sum of the Likert-type responses for the fourteen OHIP questions). The range of the total severity scores may vary from 0 to 56. Reporting these different scoring formats of the OHIP has been encouraged to improve the interpretability of the study results (Tsakos et al., 2012).

OHIP as one of the most used PBO measures is commonly reported by mean scores which indicate the severity of the impact on OHRQoL. Mean scores of groups are compared using an independent t-test/ an ANOVA F-test or its

nonparametric equivalent in cross-sectional studies. While in longitudinal studies, mean pre and post-treatment change scores are calculated with significance tests applied within and between groups. However, it is encouraged not only solely focus on reporting the mean difference as the clinical outcome of the study. Moreover, a significant difference in mean scores between the groups in a longitudinal study does not give information about whether the mean difference is meaningful either from the clinical or the participant's perspective. Thus, the difference in the score that can be shown to relate to perceived differences by subjects in a study is important, this is known as the minimally or meaningful important difference (MID). The MID indicates whether the observed change of the mean score in longitudinal study or the difference of the mean score in a cross-sectional study is meaningful (Tsakos et al., 2012).

In a longitudinal study, MID can be interpreted from the patient or clinician's perspective. From a subject's perspective, MID is the smallest difference in the OHIP score that they perceive in terms of a change and can be either positive or negative in terms of OHRQoL. From the clinician's perspective, the subject's MID can be used as a minimum desirable change after an intervention to improve the subject's OHRQoL (Graziani et al., 2019).

An attempt to determine the MID for OHIP has been reported in previous studies (Locker et al., 2004b, Allen et al., 2009, John et al., 2009). A longitudinal study conducted by Locker et al. indicates that the MID for the OHIP-14 was of 5-scale points. This study gathered data from 116 patients attended a community clinic in Toronto, Canada. The data collection was performed two times which were at the baseline (patients' first visit) and one month after the completion of various dental treatments. A questionnaire which includes OHIP-14, time since last dental appointment, and sociodemographic information were used as an instrument at the baseline data collection. For the one month after the dental treatment completion, all of the participants were given similar questionnaire as in the baseline with an addition of a question to assess self-perceived change in oral health since the completion of dental

treatment. Global ratings of change was defined as participant's perceptions of change in their oral health condition since the completion of their dental treatment, which were assessed by a single item in the questionnaire with a 5 point response scale (worsened a lot, worsened a little, stayed the same, improved a little, and improved a lot). The MID was obtained by the mean change scores of those who reported improved a little based on the global rating change. This study indicates that the mean change scores for the OHIP-14 of those who reported improved a little was equal to 5 (Locker et al., 2004b).

A study was conducted to determine the MID for the Oral Health Impact Profile-20 (OHIP-20)[1]. This study recruited 44 patients who had previously used partial dentures and had planned to replace the existing dentures. All of these patients completed pre-treatment and post-treatment questionnaires (after they had received the replacement of their existing dentures). The data in this study indicated that a mean change score of 9-scale points represents the MID estimation for the OHIP-20 (Allen et al., 2009).

Finally, a study was conducted to determine the MID for the Oral Health Impact Profile-49 (OHIP-49) in patients who need prosthodontic treatment. This study recruited 224 adult patients completed the questionnaires two times, before treatment and 4 to 6 weeks after prosthodontic treatment was finished. From the total sample of 224 patients, 94 patients received fixed prosthodontics treatment, 109 patients received removable partial dentures, and 21 patients received complete dentures. This study determined that a mean change score of 6 represents the MID significance for the OHIP-49 of the patients after the prosthodontic interventions (John et al., 2009).

Determining MID in a cross-sectional study is seen as less critical compared to the longitudinal study as the PBO measure do not compare a group pre-treatment and post-treatment. Nevertheless, the MID can still be useful as a reference to provide an important clinical context (Tsakos et al., 2012).

[1] OHIP-20 is a specific subset of OHIP-49 derived for denture users

Estimating the MID in cross-sectional studies can also be done based on the distribution-based methods, which involve effect size (ES) ad standard error of measurement (SEM) calculation. However, careful interpretation of the ES and SEM should be made as they do not provide the actual value of the MID. The ES is calculated based on the ratios of the mean change score with standard deviation of the baseline score. The SEM is calculated by multiplying the standard deviation of the instrument by the square root of 1 minus the reliability of the PBO measure (Tsakos et al., 2012).

The SEM has been proposed as a more useful distribution-based statistic than the effect size for evaluating both individual and group changes of the PBO measurements (Wyrwich et al., 1999). In addition to this, the SEM is expressed in the original metric of the instrument and not sample dependent. Any change larger then SEM values indicates the existence of real changes (Tsakos et al., 2012, Wyrwich et al., 1999). Nevertheless, the differences larger than the SEM should not de facto be considered as significant or meaningful (Tsakos et al., 2012).

2.4 Periodontal disease and quality of life

2.4.1 Overview of periodontal disease classifications

At the initial stage of chronic periodontitis, individuals may be unaware of their periodontal problems due to non-significant symptoms of this disease. Thus, the early stage of this disease is often neglected without searching for treatment from dental health professionals (Jin et al., 2016, Cunha-Cruz et al., 2007). However, this disease may progress to an advanced stage and create symptoms that may affect individuals well-being, such as gingival recession, pain, eating difficulties, tooth drifting and mobility, and tooth loss (Cunha-Cruz et al., 2007).

Periodontal disease was classified into eight categories, which are gingival diseases, chronic periodontitis, aggressive periodontitis, periodontitis as a manifestation of systemic diseases, necrotising periodontal disease,

abscesses of the periodontium, periodontitis associated with endodontic lesions, and developmental or acquired deformities and conditions based on the International Workshop for a Classification of Periodontal Diseases and Conditions 1999 (Newman et al., 2018, British Society of Periodontology, 2016, Armitage, 1999). This periodontal disease categorisation had been used for the last 19 years since 1999. Then, a new classification of a scheme for periodontal disease has been introduced recently after the proceedings of the World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions, which was conducted in November 2017. The recent classification divided periodontal diseases and conditions into three categories, which are periodontal heath, gingival diseases and conditions; periodontitis; and other conditions affecting the periodontium (Caton et al., 2018). The details of the new classification of periodontal disease published in March 2018 is presented in Figure 2.5.

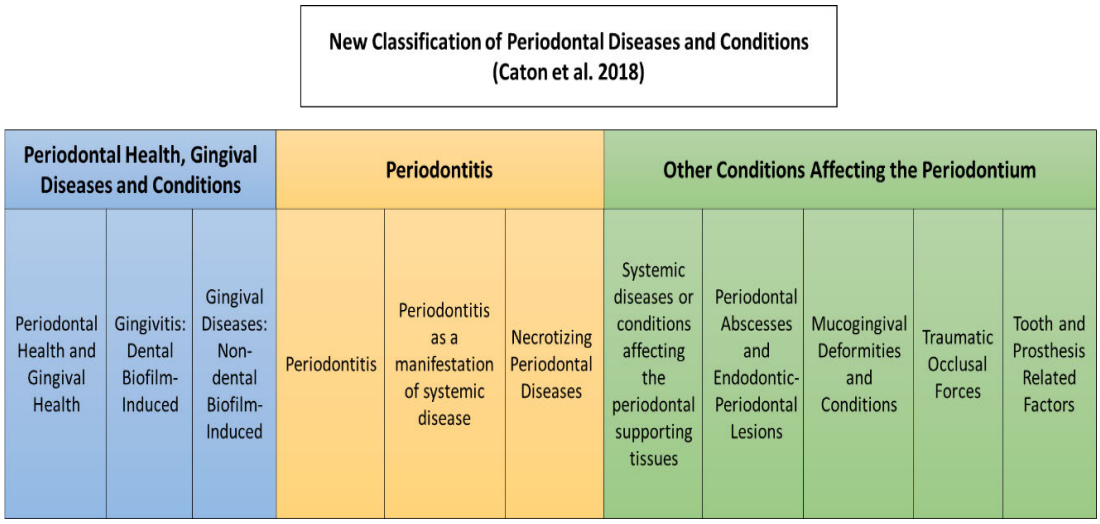

Figure 2.5 New classification of periodontal diseases and conditions 2017. This classification divided periodontal diseases and conditions into three categories: periodontal health, gingival diseases and conditions category, periodontitis category, and other conditions affecting the periodontium category. Each category has several groups of periodontal diseases and conditions as it can be seen on the figure (Caton et al., 2018).

Healthy periodontal is defined as the absence of clinically detectable inflammation, attachment loss, and bone loss. For an epidemiological purpose, healthy gingival is defined as less than 10 per cent of the gingiva has bleeding sites with probing gingival sulcus depths less than 3 mm (Chapple et al., 2018).

Dental-plaque biofilm induced gingivitis and chronic periodontitis are the two most common forms of periodontal disease (Newman et al., 2018). Dental plaque-induced gingivitis is characterised by inflammation of the soft tissue and does not involve attachment loss or bone destruction. However, gingivitis may also occur on a periodontium with attachment loss that is stable and not progressing. Dental plaque-induced gingivitis is the most common form of gingivitis. Most of the people are commonly unaware of this disease as it usually painless and rarely cause spontaneous bleeding (Trombelli et al., 2018). Gingival diseases can also be associated with non-plaque induced risk factors, such as bacterial infection, viral infection, fungal infection, genetic origin, systemic conditions, foreign body reactions, neoplasm, traumatic lesions, malnutrition, and gingival pigmentation (Holmstrup et al., 2018).

Gingivitis is considered as the precursor of periodontitis. Previous cohort studies provide the evidence of the relationship between gingivitis and periodontitis, where the progression of the attachment loss was related with the levels of gingival inflammations (Trombelli et al., 2018, Ramseier et al., 2017). Periodontitis is characterised by progressive destruction of both soft and hard supporting tissues of the teeth. Dental plaque and calculus, periodontal pocketing, gingiva marginal recession, bone loss, gingival inflammation and bleeding on probing are common clinical signs of periodontitis (Newman et al., 2018).

Chronic periodontitis is the most prevalent form of periodontitis and the major cause of tooth loss in adults (Jin et al., 2016, Pihlstrom et al., 2005). This disease is common in adults and also occurs less frequently in children and adolescents (Armitage, 1999, Newman et al., 2018). Chronic periodontitis progresses gradually through time, the rate of progression is related to the amount of dental plaque present in the mouth (British Society of

Periodontology, 2016, Newman et al., 2018). Chronic periodontitis can present in the mouth as localised or generalised depending on the number of teeth affected by the disease demonstrated by the clinical attachment and bone loss. The localised periodontitis is defined as less than 30 per cent of the teeth affected by the periodontal disease. While in generalised periodontitis, the teeth affected by the periodontal disease are 30 per cent or more (British Society of Periodontology, 2018, Newman et al., 2018)

Aggressive periodontitis is characterised by the rapid progression of periodontal destruction. This disease is usually found in young individuals of age less than 35 years old, particularly at the time of puberty (Newman et al., 2018, British Society of Periodontology, 2016).

Necrotising periodontal disease is divided into two forms which are necrotising ulcerative gingivitis (NUG) and necrotising ulcerative periodontitis (NUP). The primary clinical characteristic of the necrotising periodontal disease is tissue necrosis which includes necrotic papillary and marginal gingiva covered by a greyish pseudo membrane. Spontaneous bleeding and pain are also very common symptoms of this disease (Papapanou et al., 2018). Smoking, poor oral hygiene, and psychological stress are common predisposing factors of the NUG (Newman et al., 2018, British Society of Periodontology, 2016). While NUP is almost exclusively reported in immunocompromised persons, such as people with HIV/AIDS (Newman et al., 2018).

Periodontitis as a manifestation of systemic diseases is an inflammation of periodontium caused by systemic conditions, such as hematologic (e.g. acquired neutropenia and leukaemias) and genetic disorders (e.g. Papillon Lefevre Syndrome, leucocyte adhesion deficiency, and hypophosphatasia) (Jepsen et al., 2018). The clinical signs of this form of periodontitis are quite similar to aggressive periodontitis, which is characterised by rapid destruction of periodontium and the possibility of early tooth loss. Other systemic diseases may also affect the periodontal supporting tissues independently of dental plaque-induced inflammation, such as neoplastic disease (e.g. squamous cell carcinoma, Langerhans cell histiocytosis) (Newman et al., 2018).

Abscesses of the periodontium are characterised by a localised purulent infection in the periodontal tissues (Newman et al., 2018). A periodontal abscess is hard to differentiate with the periapical abscess when both of them are present at the same time (British Society of Periodontology, 2016).

Periodontitis associated with endodontic lesions is categorised based on the origins of the lesions, which either from the dental apex (endodontic-periodontal lesions) or periodontium (periodontal-endodontic lesions) (British Society of Periodontology, 2016, Newman et al., 2018). Endodontic-periodontal lesions precede with pulpal infection and necrosis of the teeth before the bacterial infection progress to the destructions of periodontal ligament and alveolar bone. Endodontic-periodontal lesions are usually found as localised and deep periodontal pockets that extend to the apex of the tooth. Periodontal-endodontic lesions are less common than endodontic-periodontal lesions. The bacterial infection from the periodontal pocket spreads to the apex of the tooth. The bacterial exposures then affecting tooth pulpal resulting in pulpal necrosis. They most commonly occur on multi-rooted teeth with differential bone loss on the various roots (Newman et al., 2018).

Acquired deformities may initiate plaque accumulation which could progress into periodontal destruction. Periodontitis caused by acquired deformities is divided into four sub-groups based on its etiologic, which are localised tooth-related factors (e.g. tooth anatomy factor, dental restorations or appliances, and root fractures), mucogingival deformities and conditions around teeth, mucogingival deformities and conditions on edentulous ridges, and occlusal trauma (Newman et al., 2018).

Traumatic occlusal force may also have effects on the periodontium when the force exceeds the adaptive capacity of teeth and periodontium. The excessive occlusal force may cause thermal sensitivity, tooth mobility, tooth migration, fractured tooth, discomfort or pain on chewing, root resorption, and cemental tear (Fan and Caton, 2018).

Factors related to prostheses has been introduced in the new classification of periodontal diseases and conditions (Caton et al., 2018). The prostheses' design, fabrication, and materials have been considered affecting the periodontium health, particularly related to the increase plaque accumulation, which may lead to the initiation and progression of gingivitis and periodontitis. These prostheses' factors may also introduce trauma and allergic reactions on the periodontium toward the prostheses' materials (Ercoli and Caton, 2018).

2.4.2 Periodontal diseases risk factors

Both dental caries and periodontal disease share common risk factors with other non-communicable diseases, such as poor diet, tobacco use, stress and depression, genetic factors, and socioeconomic factors (Griffin et al., 2012, Jin et al., 2016). Thus, the management of periodontal disease must consider a patient's general health status and the risk factors of the disease (Newman et al., 2018).

Periodontal disease has complex risk factors which include modifiable and non-modifiable factors. Modifiable factors are divided into local and systemic factors, while the non-modifiable factors underline individuals' socioeconomic status, genetics, adolescence, pregnancy, age, and leukaemia. Table. 2.3 presents the categorisation of periodontal disease risk factors.

Table 2.7 Risk factors for periodontal disease, which involve both modifiable and non-modifiable factors based on the periodontology guide published by the British Society of Periodontology (British Society of Periodontology, 2016).

Periodontal disease risk factors		
Modifiable factors		Non-modifiable factors
Local factors	Systemic factors	
Acquired: • Plaque & calculus • Partial dentures • Open contacts • Overhanging and poorly contoured restorations Anatomical: • Malposition teeth • Furcation • Root grooves and concavities • Enamel pearls	• Smoking • Diabetes • Poor diet • Certain medications • Stress	• Socioeconomic status • Genetics • Adolescence • Pregnancy • Age • Leukemia

Local risk factors of periodontal disease are divided into acquired and anatomical factors. The primary local risk factor of periodontal disease is bacterial dental plaque accumulation on the teeth. The accumulation of the dental plaque can be reinforced by other acquired factors and anatomical factors, such as calculus, overhanging margins of restorations, and food impaction caused by malposition teeth (British Society of Periodontology, 2016).

Calculus is mineralised bacterial dental plaque which may be found on the surfaces of both natural teeth and dental prostheses. Calculus can be found both above the free gingival margins (supragingival) and below (subgingival). Calculus has a crucial role in the progression of periodontal disease as it can maintain the close contact of plaque with gingival tissue and create an environment where it is challenging to remove dental plaque. Thus, the removal of dental plaque and both supragingival and subgingival calculus is

an efficient therapy to reduce gingival inflammation and pocket depths in patients with periodontal disease (Newman et al., 2018). However, a recent study conducted in the UK found evidence of little or no difference of gingivitis and periodontal pocket/sulcus probing depth when comparing adults without severe periodontitis who regularly had routine (six- and 12-monthly) scale and polish treatment and those who did not have routine scheduled of scale and polish treatment. Nevertheless, this recent evidence need to be taken carefully as this study also highlights that neither adverse effects, changes in attachment level, tooth loss or halitosis were measured in the study between the group who had routine scale and polish treatment and group who did not have routine schedule of scale and polish treatment (Lamont et al., 2018).

Other predisposing acquired factors might also play important roles in accentuating the progression of periodontal disease. Iatrogenic factors such as inadequate quality of dental restorations and dentures may contribute to the gingival inflammation and periodontal tissue destructions. Inadequate restorations may affect an individual's ability to remove dental plaque. Over or under contoured restorations will leave areas where it is practically impossible to clean with conventional oral hygiene products. In addition to this, the location of the gingival margin and roughness of restoration may also introduce food impaction and plaque accumulation which may lead to the gingival inflammation. The poorly design of partial removable dentures might cause mobility of the abutment teeth, gingival inflammation, and formation of a periodontal pocket (Newman et al., 2018).

Besides the acquired factors, the anatomical factors might also influence people's periodontal health. For instance, malposition teeth, furcation, root grooves and concavities, and enamel pearls may bring potential plaque accumulation (Newman et al., 2018, British Society of Periodontology, 2016). Thus, these anatomical factors may present a challenge in plaque control and periodontal disease treatment prognosis (Newman et al., 2018).

Besides local factors mentioned above, some systemic conditions also can be considered as contributing factors of periodontal disease, such as smoking,

diabetes, poor diet, stress, and certain medications (British Society of Periodontology, 2016). Previous studies have demonstrated that the prevalence of pocket depth, attachment loss, and alveolar bone loss was higher in smokers compared to non-smokers (Johnson and Guthmiller, 2007, Johnson and Hill, 2004, Tonetti, 1998). The host-bacterial interactions are altered by smoking results in increasing severity of periodontal destruction. This possibly caused by changes in the composition of the subgingival plaque with increases colonization of the periodontal pockets by pathogenic pathogens. Previous studies have shown that smoker showed significantly higher amounts of *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans,* and *Tannerella forsythia* than non-smokers in their periodontal pockets with equal probing depths (Guglielmetti et al., 2014, Hanioka et al., 2019). In addition to this, smokers also shown that they did not respond to periodontal treatment as good as non-smokers, which associated with the remaining amounts of *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans,* and *Tannerella forsythia* in the smoking group compare to the non-smoking group (Renvert et al., 1998, Haffajee et al., 1997, Newman et al., 2018). Thus, smoking status assessment and smoking cessation are an important part of the successful periodontal treatment (British Society of Periodontology, 2012)

Diabetes mellitus has been established as one of the important systemic factors which give significant effect to periodontal health. Poorly controlled diabetes raises vulnerability to periodontal infections and destructions, which lead to periodontal disease and tooth loose. Diabetes mellitus is divided into two types. Type 1 diabetes is known as insulin-dependent diabetes mellitus *(IDDM).* Type 2 diabetes is known *as* non-insulin-dependent diabetes mellitus (NIDDM). Type 2 diabetes is the most prevalence diabetes, which accounts for 90-95 per cent of all diagnosed diabetes in adults (Newman et al., 2018). As there is a significant difference in the prevalence between type 1 and type 2 diabetes, the evidence of its impact on the periodontal tissues mostly comes from patients with type 2 diabetes (Jepsen et al., 2018). Periodontitis has been

significantly and independently associated with type 2 diabetes (Chapple, 2014).

Another systemic risk factor is a poor diet which leads to nutritional deficiencies. Nutritional deficiencies may contribute to enhance the detrimental effects of dental plaque on periodontal health. For instance, previous studies have been shown that individuals with vitamin C deficiency are more prone to periodontitis (Chapple et al., 2017, Van Der Velden et al., 2011). Moreover, vitamin C deficiency may also cause profuse gingival bleeding (Chapple et al., 2017). In addition to this, taking vitamin D supplementation combined with calcium intake has been shown evidence to improve periodontal health and reduce tooth loss in the elderly (Krall et al., 2001)

Psychological stress and depression have an impact on both general and oral health. Prolonged and intense pressure on the mental condition may lead to the suppression of the immune system. Stress-induced immunosuppression most likely accentuates the harmful effects of bacterial infection in the mouth. In addition to this, stress might alter individuals' willingness to maintain their oral health. For instance, stress might reduce participants' oral hygiene by less frequent brushing and might also be a trigger for them to smoke more frequently. Moreover, individuals who experience high pressure of stress may have less awareness about daily nutrition intake. All of these behavioural changes related to the stress potentially increase individuals susceptibility to periodontal disease (Newman et al., 2018, British Society of Periodontology, 2016).

Particular medication prescribed to manage specific diseases are also known to bring adverse effects to periodontal tissues (British Society of Periodontology, 2016, Newman et al., 2018). Calcium channel blockers (e.g. *nifedipine*) used in the treatment of hypertension may induce gingival enlargement. *Nifedipine* potentially induces gingival overgrowth in more than 6.39 per cent patients treated with this medicine (Ellis et al., 1999). Severe gingival enlargements may introduce problems, such as problems with speech and mastication (Mavrogiannis et al., 2006). In addition to this, *nifedipine* also

increases the risk of periodontal destruction in patients with diabetes mellitus type 2 (Newman et al., 2012). Other medications, such as cyclosporine, which is used as an immunosuppressant agent for patients with organ transplants, and phenytoin, which used to control epilepsy, may also increase the risk of gingival enlargement. It is crucial to work together with general medical colleagues if certain medications are suspected trigger the gingival overgrowth and periodontal destructions. General medical colleagues may suggest the appropriate alternative drugs as replacements to the medicine which increase the risk of periodontal disease (British Society of Periodontology, 2016, Newman et al., 2018). For example, the substitution of nifedipine with amlodipine as a calcium channel blocker can reduce the risk of gingival overgrowth from around 6.39 per cent to around 1.7 per cent of the subjects (Ellis et al., 1999).

The British Society of Periodontology has emphasised the importance of identification of the local factors before planning periodontal therapy. In addition to this, clinicians need to assess the patient's overall condition before proposing a periodontal treatment plan. The comprehensive evaluation of the patient includes dental health status, systemic factors, mental and emotional status, and physiologic age of the patients. For patients with systemic disease, the management of the periodontal disease should also involve medical colleagues. Moreover, careful and personalised oral hygiene instructions are also one of the essential keys to the success of periodontal treatments (British Society of Periodontology, 2016, Newman et al., 2018).

Besides the modifiable factors discussed above, there are non-modifiable factors which contribute to individuals' periodontal health. Socioeconomic status, genetics, adolescence, pregnancy, and age have been established as non-modifiable factors risk of periodontal disease. Socioeconomic has potentially related to the developing of certain chronic diseases, such as cardiovascular disease, diabetes, and periodontitis. Periodontal disease and other non-communicable diseases, such as cardiovascular and diabetes,

interlinked with common risk factors, such as smoking, poor diet, and excess sugar intake (British Society of Periodontology, 2016, Jin et al., 2016).

Some of the genetic inherited variations have an association with the risk of periodontitis. These genetic variations are related to the host defence mechanism against bacterial infections in the periodontal disease. For instance, periodontitis is often present with increased severity in individuals with *Ehlers-Danlos,* Kindler's and Down's syndromes (Newman et al., 2012).

Periodontal disease in adults is also associated with gingival inflammation experience in adolescence. The gingival inflammation experienced in childhood and adolescence without appropriate treatment might progress to a more serious periodontal problem, such as periodontitis in adults. The first signs of chronic periodontitis can be found in adolescence as chronic plaque and calculus accumulation through the years. However, clinically significant symptoms of chronic periodontitis are commonly found in mid-thirties or later because of the nature of the chronic progression of the disease (Newman et al., 2018).

Pregnancy as a systemic factor relates to the hormonal changes, which may affect periodontal health. Pregnancy may change the host response to dental plaque. Individuals who are pregnant may become more susceptible to gingival inflammation, even in the presence of low levels of plaque. Leukaemia may also cause alteration in the host response to the bacterial challenge leading to gingival enlargement and gingival bleeding (Newman et al., 2018).

The prevalence of periodontitis is also increasing with age. Thus the burden of periodontal disease is expected to increase with the growing ageing population worldwide due to increased tooth retention into old age (Tonetti et al., 2017).

In this section, we will also briefly discuss the prevalence of the modifiable risk factors of periodontal diseases mentioned above in Indonesia, where applicable and where data are available in the paragraphs below.

Except for data regarding the periodontal condition and partial dentures, there are no previous data about the prevalence of almost all of the local risk factors. This can be understood as other risks factors are not common oral conditions to be measured in the national oral health survey. The common oral health assessment recommended by the WHO include dentition status, periodontal status, loss of attachment, enamel fluorosis, dental erosion, traumatic dental injuries, and oral mucosal lesions (World Health Organization, 2013).

Based on the latest Indonesia National Health Survey 2018, there was 74.1 per cent of Indonesian age 15 years old and above who had periodontal pockets, gums bleeding, and loss periodontal tissue attachment. This figure is higher in the 45 years old and above group, which was 77.8 per cent (Badan Penelitian dan Pengembangan Kesehatan, 2019). The high proportions of the Indonesian with periodontal condition indicates the importance and severity of the periodontal disease experienced by the population.

The proportion of those used partial dentures in Indonesian was relatively low in 2018, with 3.5 per cent used removable partial dentures and 0.8 per cent used fixed partial dentures (Badan Penelitian dan Pengembangan Kesehatan, 2019). However, there was no data found regarding the partial dentures need based on the indication. The used of these partial dentures might potentially cause periodontal health problems, such as mobility of the abutment teeth, gingival inflammation, and periodontal pockets, particularly if the partial denture design was poor.

The data regarding the prevalence of the systemic risk factors of periodontal disease are available in the Indonesia National Health Survey 2018, except the prevalence of the Indonesian who used of the particular medication which potentially affects the periodontal health negatively. The national figure of the prevalence of smokers of Indonesian age ten years and above was 34.2 per cent (24.3 per cent was current daily smokers, 4.6 was current occasional smokers, and 5.3 was former smokers) (Badan Penelitian dan Pengembangan Kesehatan, 2019). The smoking prevalence was higher in male than female. There was 55.8 per cent current smokers among the male population, 9.2 per

cent was former smokers, and 35 per cent was never a smoker. In contrast, there was only 1.9 per cent female who categorised as current smokers, 1.3 per cent was former smokers, and 96.8 was never a smoker (Badan Penelitian dan Pengembangan Kesehatan, 2019). As smokers are more prone to periodontal destruction than non-smokers, it can be expected that more male population had experienced more problems with their periodontal health compare to female population based on the smoking status figures reported in the Indonesia National Health Survey 2018.

The prevalence of diabetes diagnosed by health professionals was 1.5 per cent for the Indonesia national figure in 2018. The prevalence of diabetes was higher in older people with more than 6 per cent of the population had diabetes for 55 years old and above group (Badan Penelitian dan Pengembangan Kesehatan, 2019). These figures need to be interpreted carefully as the National Health Survey 2018 underlined that the data based on the diabetes status diagnosed by the health professionals, thus there was a possibility that some of Indonesians had diabetes symptoms, but they did not go to the health professionals to be checked or diagnosed. Some of the periodontal destructions which can be seen in those with poorly controlled diabetes include severe gingival inflammation, deep periodontal pockets, rapid bone loss, and frequent periodontal abscesses (Chapple, 2014, Newman et al., 2018).

Poor diet is one of the systemic factors which contribute to the detrimental effect of dental plaque on periodontal health. Almost 11 per cent of Indonesian age five years old and above did not consume any fruit and/or vegetables in a week (Badan Penelitian dan Pengembangan Kesehatan, 2019). Those who had vitamins deficiency affected by their eating lifestyles potentially had experienced some periodontal health problems.

Based on the National Health Survey 2018, there was 6.1 per cent of Indonesian experienced some form of depression (Badan Penelitian dan Pengembangan Kesehatan, 2019). Psychological stress and depression might potentially affect their periodontal health as stress might alter their willingness and ability to maintain oral health.

2.4.3 Previous studies relating periodontal disease and oral-health related quality of life

Despite being acknowledged as one of the two most common burdens of oral disease, less attention has been given to the impact of periodontal disease on quality of life compared with dental caries (Bernabé and Marcenes, 2010). Furthermore, the focus of previous studies scrutinises the relationship between periodontal disease and quality of life from the quantitative research sides. Periodontal disease status is commonly assessed based on the clinically measured of periodontal health of patients/ participants under the study through medical and dental history, clinical and radiographic examinations. A growing literature has evaluated the impact of periodontal disease on OHRQoL through PBOs (Ferreira et al., 2017b, Buset et al., 2016b). An understanding of the impacts of periodontal disease on quality of life from individuals' subjective assessment is crucial for planning and evaluating the periodontal treatment given by the dental workforce and public health interventions (Bernabe and Marcenes, 2010).

Previous studies from a variety of developed countries (United Kingdom, USA, German, and Sweden) (Needleman et al., 2004, Cunha-Cruz et al., 2007, Jowett et al., 2009, Brauchle et al., 2013, Jansson et al., 2014, White et al., 2012, Bernabe and Marcenes, 2010) and a limited number of studies from developing countries (China and Brazil) (Lu et al., 2015, Palma et al., 2013) have confirmed significant relationship between periodontal disease status and quality of life.

Needleman and colleagues have tried to measure the impact of periodontal disease on quality of life in patients attending a private specialist periodontal practise over a six month period (Needleman et al., 2004). Their study used UK oral health-related quality of life measure (OHQoL-UK©) as an instrument to assess the well-being of a sample of 205 patients. There are 16 items in this instrument with responses on a 5-point Likert scale. The sum of the responses from each of the 16 items will produce the total scores ranging from 16 (representing the poorest score of oral health-related to quality of life possible)

to 80 (representing the best score of oral health-related to quality of life possible). In addition to the OHQoL-UK©, patients were asked about symptoms related to their periodontal condition in the past year: experiences of swollen gums, sore gums, receding gums, loose teeth, drifting teeth, bad breath, and toothache. Furthermore, a basic periodontal examination was conducted to assess each patient's periodontal condition. The results from the data analysis of this study illustrated that the patient's OHQoL-UK© score differed significantly according to the severity of the symptoms of periodontal disease reported by the patients. Patients who did not report having particular periodontal symptoms had higher mean OHQoL-UK© score than patients who reported that they had experienced specific symptoms of periodontal disease. Furthermore, this study also found that patients with high numbers of teeth with deep periodontal pockets (≥ 5 mm) had low OHQoL-UK© scores. Moreover, it was shown that patients who received periodontal treatment and were in the maintenance phase had a better oral health-related quality of life than new periodontal patients who have not received periodontal care (Needleman et al., 2004).

A study conducted in Washington (USA) to assess OHRQoL of patients with periodontal disease has found that individuals who suffer from a generalised form of chronic periodontitis are more likely to experience noticeable symptoms which may affect their well-being. The quality of life was measured by a short OHRQoL questionnaire which consists of six questions about the effect of chronic periodontitis on eating, relaxing, avoiding going out, feeling self-conscious or worried, pain, and denture discomfort. The particular symptoms frequently found in chronic periodontitis patients were tooth mobility and unaesthetic loss of anterior interproximal papillae (Cunha-Cruz et al., 2007).

Other studies looking into the impact of periodontal disease and periodontal therapy on oral health-related quality of life have confirmed the positive effect of periodontal treatment to quality of life (Jowett et al., 2009, Brauchle et al., 2013).

Jowett et al. investigated the impact of periodontal disease and its treatment on quality of life. This is a case-control cohort study to assess the OHRQoL of the patients who came to Charles Clifford Dental Hospital, Sheffield, United Kingdom. The control group consisted of 16 patients who attended the hospital for a routine 6-month review. The inclusion criteria of this group was a maximum of Basic Periodontal Examination (BPE) score 2 in any sextant (no pockets more than 3.5 mm). On the other hand, the case group consisted of 20 patients referred to the hospital for specialist periodontal care. The inclusion criteria of the case group was a BPE code 3 or 4 (pockets probing depths more than 4 mm). The control group received scaling and oral hygiene advice, while the case group underwent root surface debridement and oral hygiene advice. OHIP-14 was conducted for both groups at the initial assessment and was then administered over the telephone by trained dental nurses to both groups each day of the seven days after their periodontal care. For the case group, another OHIP-14 measurement was reviewed in the period of between 2 and 10 months for the final assessment. This study reported a notable improvement in the OHRQoL of patients in the case group after they received root surface debridement and oral hygiene advice. However, OHRQoL of the case group was always significantly poorer than the control group at the baseline first visit, each day of the seven days after periodontal care, and after 2-10 months review (Jowett et al., 2009).

Brauchle et al. conducted a study with 93 patients participated in this study. The participants in this study were divided into a control group which consists of 11 patients (probing pocket depth (PPD) less than 4 mm) and a case group which involved 82 patients diagnosed with periodontitis (PPD more than 4 mm). This study reported that there was an improvement in the clinical periodontal condition of patients diagnosed with periodontitis after therapy: mean PPD decreased significantly from 4 mm at baseline to 2.97 mm 6-8 weeks after treatment. Furthermore, this study found that periodontal treatment was correlated with oral health-related quality of life: the mean score of the short German version of OHIP (OHIP-G 14) decreased by 1.5 from 6.3

at baseline to 4.8 6-8 weeks after treatment indicating a significant improvement in OHRQoL (Brauchle et al., 2013).

A cross-sectional study to assess the impact of periodontal disease on the well-being of pregnant women in Shanghai (China) was conducted. This study involved 512 pregnant women (18 years old to 42 years old) as participants. The range of gestational age of these women was 5 weeks to 40 weeks. This study reported that the most negatively affected OHIP dimensions were functional limitation, physical pain, and psychological discomfort in this cohort. The items from these dimensions which have a greater negative impact for pregnant women were “taste worse” (functional limitation dimension), “painful aching” and “uncomfortable to eat” (physical pain dimension), and “self-conscious” (psychological discomfort dimension) (Lu et al., 2015).

In addition to this, some works of literature also confirmed that periodontal disease significantly associated with higher severity of the impact on the quality of life. Periodontal disease status was assessed by probing pocket depth. Furthermore, the severity of the impact of periodontal disease on quality of life was measured by the total OHIP-14 score. These studies were conducted in Sweden, the United Kingdom and Brazil as research backgrounds (Jansson et al., 2014, Palma et al., 2013, White et al., 2012, Bernabé and Marcenes, 2010).

Besides those literature confirming the relationship between periodontal disease status and OHRQoL, there are also studies that have not shown a relationship between periodontal disease status and OHRQoL (Kato et al., 2018, Sanadhya et al., 2015, Lawal et al., 2014, Khalifa et al., 2013, Montero-Martin et al., 2009, Marino et al., 2008)

A recent study with data derived from two cohorts of people living in Gothenburg, Sweden found the lack of statistical significance of the association between periodontal disease status and poor OHRQoL determined using OHIP-14 based on the severity and prevalence of the impact on the quality of life. Periodontal status was measured based on probing depth and categorised into three groups; no teeth with periodontal pocket, localised

periodontitis, and generalised periodontitis. This study involved 804 participants aged 70 years and above. The study did identify a significant association between the number of retained teeth and OHRQoL with better reported QoL in people with more teeth (Kato et al., 2018).

A cross-sectional study with a sample of 270 regional government staff in Granada Spain showed no significant relationship between normative needs for periodontal treatment and impact on the OHRQoL. The measurement of this relationship was assessed based on the severity and extent of the impact on the quality of life, which was measured using the OHIP-14 (Montero-Martin et al., 2009). In addition to this, a study which recruited Southern European migrant older adults living independently in Melbourne, Australia, also found lack of statistically significant evidence of the association between periodontal status and quality of life based on the severity of the impact assessment of the OHIP-14 (Marino et al., 2008).

In addition to this, similar results regarding the lack evidence of the important relationship between periodontal disease status and OHRQoL was also exhibited in the previous studies with developing countries backgrounds, such as India, Nigeria, and Sudan (Sanadhya et al., 2015, Lawal et al., 2014, Khalifa et al., 2013). A cross-sectional study was performed to assess and compare clinical dental status with a population of rural and urban areas in Udaipur, India. Dental caries, periodontal disease, and prosthetic status measurements were included in the study as the clinical dental status of the interest. This study involved 600 participants who lived in rural and 600 participants lived in urban of Udaipur with age ranges between 20 to 79 years. The OHIP-14 was utilised as a measurement of OHRQoL. This study did not find a significant relationship between the periodontal health condition and quality of life based on the severity of the impact measurement. Periodontal health status was measured based on the Community Periodontal Index (CPI). In addition to this, this study also did not find any significant relationship between quality of life with the absence or presence of prosthetic (including partial, fixed, and total prosthesis). However, this study revealed an important relationship between

quality of life with both dental caries and missing teeth status of the participants based on the severity of the impact assessment. Tooth loss itself may result from an advanced progression of periodontitis (Sanadhya et al., 2015).

Furthermore, previous research regarding the relationship of periodontal disease status and OHRQoL conducted in other developing economies countries such as Nigeria and Sudan also confirmed the lack evidence of the relationship between periodontal disease status and poor OHRQoL (Lawal et al., 2014, Khalifa et al., 2013).

Recent systematic reviews which investigate the body of literature regarding the impact of periodontal disease on quality of life have emphasised that periodontal disease may exert negative effects on individuals OHRQoL. The evidence of the negative impact of periodontal disease was more pronounced with greater severity and the extent of the disease (Ferreira et al., 2017b, Buset et al., 2016b). Nevertheless, these systematic reviews also highlighted the importance of different expectations and perceptions of oral health and significant impairments in different cultures which may affect the relationship between periodontal disease status and quality of life (Buset et al., 2016b, Ferreira et al., 2017b). Furthermore, confounding factors such as demographics, socioeconomic characteristics, other dental conditions, dental services used, oral hygiene habits, smoking, dietary habits, stress, and compromised medical conditions of the populations might also influence the relationship between periodontal disease and the quality of life (Ferreira et al., 2017b). Slade and Saunders also emphasised the role of age as a confounding factor which might give paradox of better subjective oral health perception in older age. For instance, the impact of tooth loss and other oral disease impairments were more detrimental toward the perceived quality of life when these oral health problems occurred in adulthood rather than in old age (Slade and Sanders, 2011)

Besides confounding factors and personal expectations and perceptions of oral health conditions, various categorisation of the periodontal status and definition of periodontal disease of interest in the study might also introduce

potential bias in the relationship between periodontal disease and quality of life (Ferreira et al., 2017b, Buset et al., 2016b).

Research on the relationship between periodontal disease and quality of life mostly focus on quantitative measures of the disease. O'Dowd et al. explored the relationship using a qualitative research methodology. The study was about patients' experiences of the impact of periodontal disease on their well-being (O' Dowd et al., 2010). A semi-structured interview was chosen as a qualitative instrument in this study. The study involved 14 participants (8 women and 6 men) of different ages with a variety of periodontal diagnosis: gingivitis/ chronic periodontitis/ aggressive periodontitis. The participants in this study were periodontal disease patients attending Newcastle Dental Hospital. The themes which emerged from this study were relevant to the domains of Locker's conceptual model of oral health: impairment, functional limitation, discomfort (physical and psychological), disability (psychological, social, and physical), and handicap. This study has identified additional themes that are found in people with periodontal disease that may affect personal well-being: "stigma" and "retrospective regret". This study suggests that these negative impacts on patients' everyday lives need to be understood by the clinician in order to give better care for patients (O' Dowd et al., 2010).

As it has been described above, the strength of the previous body of literature regarding the relationship between periodontal disease and OHRQoL is the availability of information regarding this issue from various countries backgrounds.

However, there is some critical limitation identified from the previous studies. Most of these previous works have been focused on the quantitative measures of the disease and oral health-related quality of life, and very limited study conducted from the qualitative perspective regarding participants' experience with periodontal disease (Needleman et al., 2004, Cunha-Cruz et al., 2007, Jowett et al., 2009, Brauchle et al., 2013, Jansson et al., 2014, White et al., 2012, Bernabe and Marcenes, 2010, Lu et al., 2015, Palma et al., 2013, Kato

et al., 2018, Sanadhya et al., 2015, Lawal et al., 2014, Khalifa et al., 2013, Montero-Martin et al., 2009, Marino et al., 2008).

In addition to this, previous studies have mostly used a sample of the population attending dental clinics or hospitals (Lawal et al., 2014, Khalifa et al., 2013, Montero-Martin et al., 2009, Brauchle et al., 2013, Jowett et al., 2009, Lu et al., 2015). Even some of the previous works have specifically mentioned that they collected their data from patients treated in periodontics departments (Needleman et al., 2004, Palma et al., 2013, Cunha-Cruz et al., 2007). There is a lack of studies, which used a general population with a randomised sample for the data collection rather than being in a population with oral problems.

Moreover, most of the previous studies used developed countries as their background (Needleman et al., 2004, Cunha-Cruz et al., 2007, Jowett et al., 2009, Brauchle et al., 2013, Jansson et al., 2014, White et al., 2012, Bernabe and Marcenes, 2010, Kato et al., 2018, Marino et al., 2008), and only limited studies involved older people as their research participants (Kato et al., 2018, Marino et al., 2008) .

It is also important to consider the limits of comparability between the previous studies due to different OHRQoL measurement tools. There are ten different OHRQoL measurements which commonly used to assess the relationship between oral health and quality of life, and all the instruments have differences in dimensions of the instruments and calculation of the scores. These instruments are described briefly on pp. 23-25.

2.5 Knowledge gaps

From the overview of the literature review regarding periodontal disease and quality of life presented in this Chapter, there are two major knowledge gaps have been identified and are addressed in this thesis:

1. *Limited information about the relationship between OHRQoL and periodontal disease globally, and very limited studies delivered in a random sample of the population can be found.*

Despite acknowledged as the second most important global burden of oral disease, fewer studies about the prevalence of periodontal disease, risk of progression of periodontal disease, and periodontal health promotion represent in the literature compared with dental caries. This is particularly so for developing countries. Moreover, few previous studies assessing the relationship between periodontal disease and OHRQoL in a general population setting as many of these studies performed the data collection with patients attending dental clinic or hospitals as their participants. In addition to this, previous studies were mainly conducted in high and upper-middle-income countries. Thus, there is a need to investigate the relationship between periodontal disease and OHRQoL with lower-middle and low-income countries as research backgrounds. The consideration to conduct the research with various income countries background is to assess any differences in periodontal disease experiences, prevalence, expectations, and periodontal disease risk factors between developed and developing countries.

Indonesia, as a research background of this study, is categorised as a lower-middle-income country and the fourth most populous country in the world. There is virtually no information available regarding the relationship between periodontal disease and OHRQoL in the population of Indonesia in the currently available literature.

This knowledge gap will be addressed through an investigation of the relationship between OHRQoL and periodontal disease in a general population sample of urban older Indonesians. This study will involve both quantitative assessment of oral disease status, which involved periodontal health status, teeth condition, and oral hygiene status through clinical examination, and assessment of OHRQoL using OHIP-14. The details of this study can be found in Chapter 5.

2. *Previous periodontal disease and quality of life studies have focused on quantitative data with very few qualitative studies which assess the relationship between periodontal disease and quality of life.*

Periodontal disease and OHRQoL are often investigated from one side, which is a quantitative study based on the clinical findings and the OHRQoL measurements as described in the section 2.3.3 of this chapter. Very few looking at the issue related to the relationship of periodontal disease and quality of life from the qualitative research sides.

If we look at Indonesia as a research background of this thesis, there are none of the previous studies which investigate the relationship between periodontal disease and quality of life with a qualitative research design approach.

This knowledge gap will be addressed through a qualitative exploration of the effects of periodontal disease on people from the Indonesian urban sample using a semi-structured interview and thematic analysis. The details of this study can be found in Chapter 6.

Finally, this thesis will present an integrated analysis of the quantitative and qualitative data relating periodontal disease with quality of life in this sample. The mixed-methods approach of the relationship between periodontal disease and OHRQoL is presented in Chapter 7.

Chapter 3 Research methodology

This study used a mixed-method research strategy. Mixed methods research was chosen to answer the depth of the problems related to oral health quality of life and periodontal disease. This PhD study involved both quantitative and qualitative data collection, analysis, and integration of the results. Both methods are valuable to achieve the research aims. The two different types of data collected in this study offer different ways of addressing the research problems.

The quantitative study provides findings regarding the prevalence of the negative impact, severity of the impact, and the extent of the impact of oral health condition and certain risk factors on quality of life of the urban older people in Indonesia. On the other hand, the qualitative study provides an in-depth understanding of participants' personal perceptions, impressions, and experiences with periodontal disease and its negative impact on their daily life.

The design type used was a sequential explanatory where a quantitative data collection phase followed by a qualitative data collection phase (Andrew and Halcomb, 2009, Kroll and Neri, 2009). The priority of the data collection phase is equal for both quantitative and qualitative in this study. Data collection instruments of this study involved a structured questionnaire, an oral health examination, and semi-structured interviews.

The integration of the study can be found in the data collection design, where quantitative data were used to inform the selection of the participants for qualitative data collection. Furthermore, the integration of the quantitative and qualitative findings are presented and interpreted in Chapter 7.

3.1 Data organisation and study record

Study records for this research include consent forms, oral health examination results, questionnaire, and audio recording from the interview. These data from participants were not associated with participant's name or any other personal details that may refer to the participant's identity. The current University of Edinburgh practice regarding the confidentiality and data storage had been followed. These are the details of the study records management:

- The consent forms were stored as paper documents in a fireproof locked filing cabinet of the University of Edinburgh. These paper records which contain participant's name were kept separately from anonymised paper records of the questionnaire and oral health examination results.

- Data collection from the questionnaire and oral health examination were stored in 2 formats: paper documents and electronic data. The paper documents were stored in a fireproof locked filing cabinet ensuring maintenance of confidentiality of the paperwork. The electronic data were stored securely with a password protected folder stored on the University of Edinburgh network. These data can only be accessed by the PhD student and supervisors.

- Interviews audio recording were stored as electronic data. These electronic data were stored securely with password protection at the University of Edinburgh network. These data can only be accessed by the PhD student and supervisors.

All of these study records will be archived in the University of Edinburgh for the duration of PhD study and ten years post completion PhD study.

3.2 Research ethics and informed consent

Ethical approval for this study was obtained on 7th November 2017 from the Ethics Committee of Faculty Dentistry, Universitas Indonesia (ref: 138/ Ethical Approval/FKGUI/XI/2017). The ethical approval for the data collection in Indonesia was not required by the Edinburgh Dental Institute, the University of Edinburgh, once ethics approval from the Universitas Indonesia was obtained. Written informed consent was obtained from each participant before commencing the oral health examination, questionnaire completion, and interview.

The ethical approval letter of this study in Indonesian and English are presented in Appendices 3.1 and 3.2, respectively. The informed consent form for the quantitative data collection (oral health examination and questionnaire completion) in English and Indonesian can be found in Appendices 3.3 and 3.4. In addition to this, the informed consent form for the qualitative data collection (semi-structured-interview) in English and Indonesia are described in Appendices 3.5 and 3.6, respectively.

3.3 Data collection instruments

Data collection instruments in this study involved a structured questionnaire, oral health examination, and an interview topic guide to gather quantitative and qualitative data.

3.3.1 Structured questionnaire

The questionnaire in this study involved questions about participants' background information, smoking and tobacco use status, diabetes status, oral health behaviour, a pattern of dental attendance, and participants' perception regarding their oral health.

This questionnaire had been tested in a pilot study with Indonesians living in Edinburgh as participants prior to the data collection in Indonesia. Furthermore, the participants who involved in the pilot were given an

opportunity to give feedback regarding the questionnaire through the self-completion questionnaire feedback form. The feedback from the participants was used to improve the questionnaire. More details information regarding the pilot can be found in Chapter 4: Pilot study: Development of interview topic guide and questionnaire.

In addition to the questionnaire which had been revised based on the participants' feedback in the pilot, the short form of the Oral Health Impact Profile was added to the structured questionnaire to assess the relationship between oral health and well-being. OHIP has not been fully validated in Indonesian. However, it has been in Malaysian (OHIP (M)) and Indonesia and Malaysia have similar cultural and linguistic roots (Liow, 2004).

This S-OHIP (M) instrument was translated forward (from Malaysian into Indonesian) and backwards (from Indonesian into Malaysian) prior to the data collection in Indonesia. The purpose of the forward and backwards translations of the S-OHIP (M) is to achieve an Indonesian version of the Malaysian OHIP instrument that is acceptable and conceptually equivalent to be used in an Indonesian population. These forward and backwards translations were conducted by two independent translators who are fluent in both Malaysian and Indonesian. Both of them are Malaysian native speaker and have experience of studying in Indonesia.

The structured questionnaire was used as a part of the quantitative research instruments together with oral health examinations. This questionnaire can be found in Appendices 3.7 and 3.8 in English and Indonesian, respectively.

3.3.2 Oral health examination

The oral health examination flowchart of this study is presented in Figure 3.1. It elucidates the oral hygiene, teeth condition and periodontal measurements.

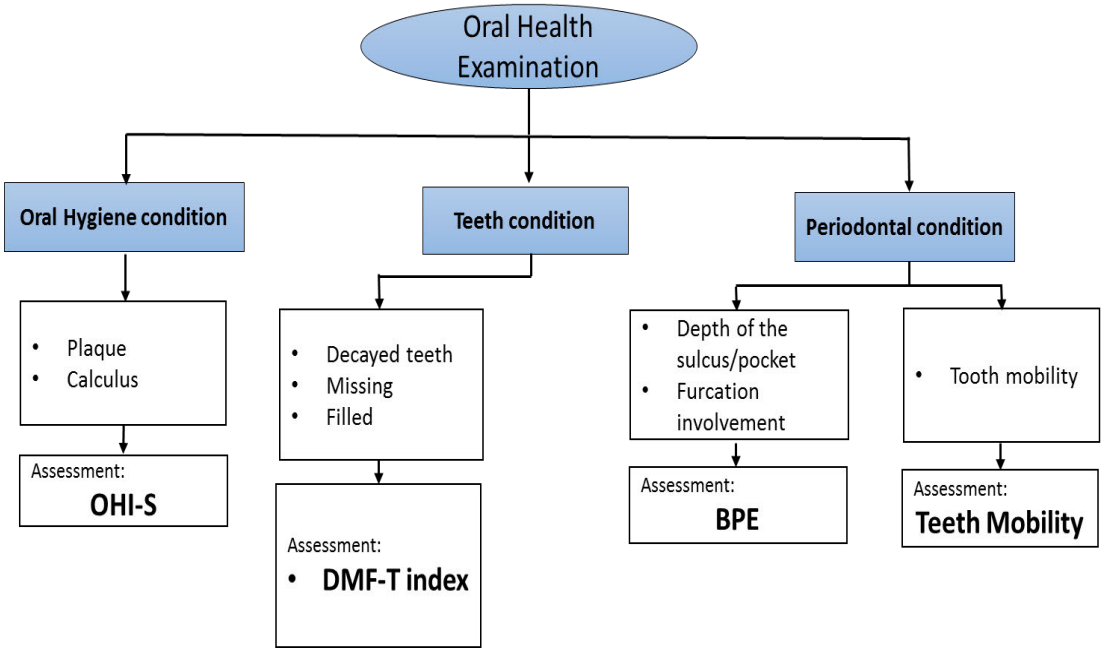

Figure 3.1 Oral health examination flowchart

The Intraoral examination was used to record the condition of all teeth, including status as decayed, missing or filled using the Decayed, Missing and Filled Teeth Index (DMF-T) to report tooth condition (World Health Organization, 2013). The Simplified Oral Hygiene Index (OHI-S) was used to assess oral hygiene condition (Greene and Vermillion, 1964). The Basic Periodontal Examination (BPE) as developed by the British Society of Periodontology was used to assess periodontal condition (British Society of Periodontology, 2016). In addition to this, tooth mobility was examined based on the tooth mobility grade (Scottish Dental Clinical Effectiveness Programme, 2014). The oral health examination form is presented in Appendix 3.9.

Dental instruments used for this oral health examination were mouth mirror, dental explorer, and Clinical Community Periodontal Index of Treatment Needs (CPITN-C) probe. All the dental instruments were sterile, single-use and disposable. The dental instruments are illustrated in Figure 3.2.

Figure 3.2 Dental instruments used in this study are sterile single-use instruments. Each pack of the sterile single-use instruments consists of CPITN/Probe No.8 Double Ended and Front Surface Mirror Plane 4. The instruments are manufactured by UnoDent Ltd.

3.3.2.1 Teeth condition examination

The DMF-T index was used to record all teeth condition, including decayed, missing, and filled teeth. Codes for teeth status used in this study is shown in Table 3.1.

Table 3.1 Codes for teeth status (World Health Organization, 2013)

Codes	Teeth condition
0	Healthy/ Sound
1	Decayed
2	Filled, with decay
3	Filled, no decay
4	Missing, as a result of caries
5	Missing, any other reason
6	Fissure sealant
7	Bridge abutment, special crown or veneer/implant
8	Un-erupted tooth
T	Trauma (fracture)
9	Not recorded
10	Missing, but participant does not know the reason

The Decayed, Missing and Filled Teeth Index (DMF-T) were calculated from teeth status (World Health Organization, 2013).

- Decayed teeth: includes all teeth with codes 1 and 2
- Missing teeth: includes all teeth with codes 4, 5, and 10
- Filled teeth: include teeth with code 3

The basis for DMF-T calculations is all permanent teeth (32 teeth) including wisdom teeth. The DMF-T clinical outcome is calculated based on the number of decayed, missing, and filled teeth. However, if a participant has teeth coded with 6, 7, 8, 9, and T are not included in DMF-T calculations.

These are the details of the DMF-T clinical outcomes (scores) categorisation based on the oral health survey guidance provided by the World Health Organization (World Health Organization, 2013):

- Very low: DMF-T score < 5
- Low: DMF-T score 5–8
- Moderate: DMF-T score 9–13
- High: DMF-T score > 13

3.3.2.2 Oral hygiene examination

The dentition were divided into six segments. Segment 1 refers to teeth in upper right (teeth 18 to14), segment 2 includes upper anterior teeth (teeth 13 to 23), segment 3 consists of teeth in the upper left (teeth 24 to 28), segment 4 refers to teeth in the lower left (teeth 34 to 38), segment 5 includes lower anterior teeth (teeth 43 to 33), and segment 6 consists of teeth in the lower right (48 to 44). The segments distribution of the teeth is illustrated in Figure 3.3.

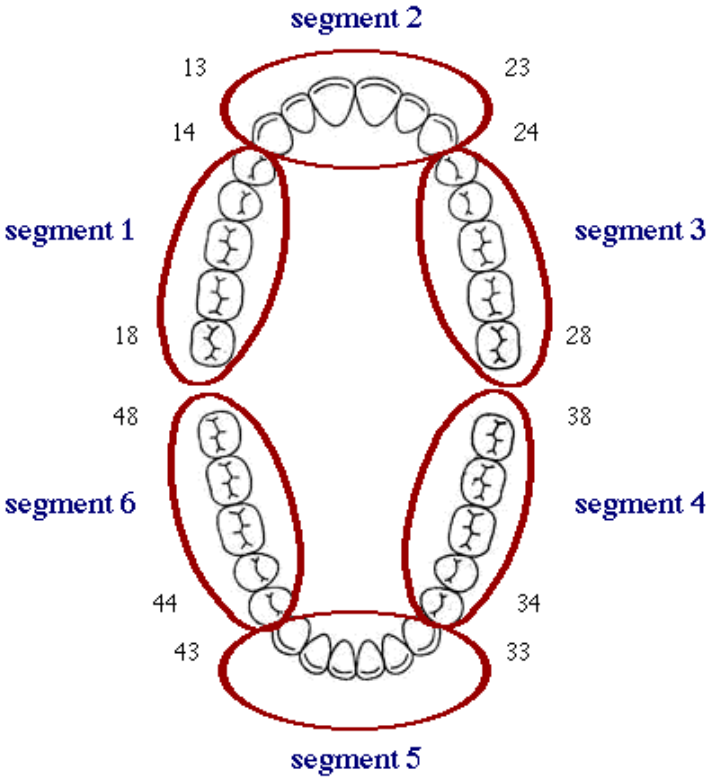

Figure 3.3 Segments distribution of the teeth. There are six segments presented in the figure: segment 1 (teeth 18 to 14), segment 2 (teeth 13 to 23), segment 3 (teeth 24 to 28), segment 4 (teeth 34 to 38), segment 5 (teeth 43 to 33), and segment 6 (teeth 48 to 44) (Greene and Vermillion, 1960, Tayanin, 2015a).

The OHI-S has two components, the Debris Index and the Calculus Index. Each of these indexes is based on numerical scoring representing the amount of debris or calculus found on the six teeth (four posterior teeth and two anterior teeth) for each participant (Greene and Vermillion, 1964, Broadbent et al., 2011, Hiremath, 2011). The six surfaces examined for the OHI-S are shown in Figure 3.4.

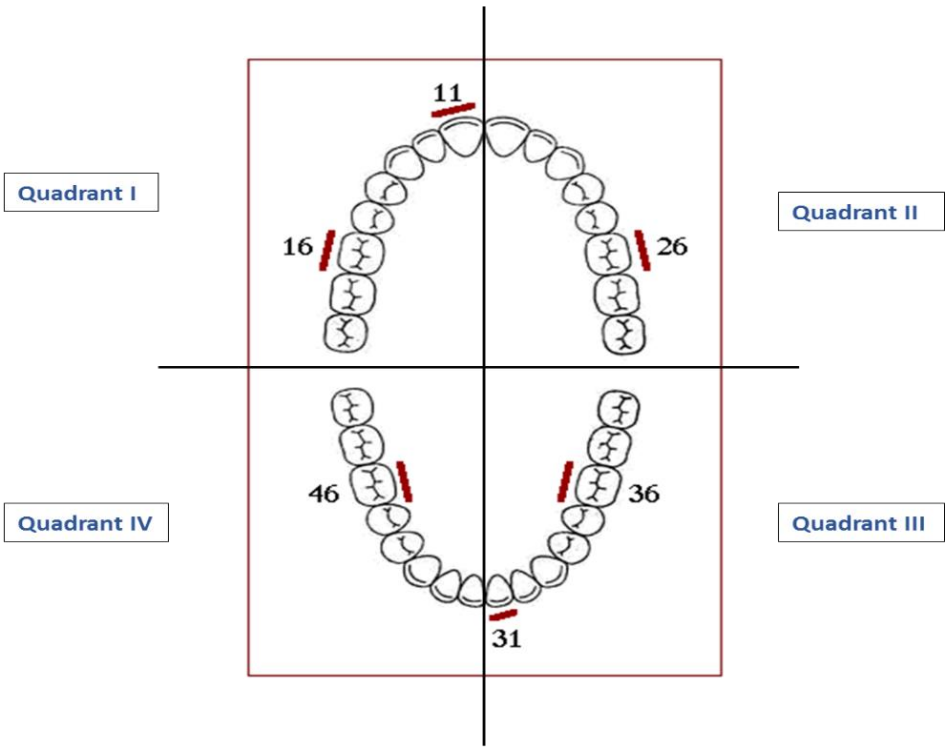

Figure 3.4 The six surfaces examined for the OHI-S: the buccal surface of the right upper jaw first molar (tooth 16), the labial surface of the upper right central incisor (tooth 11), the buccal surface of the left upper jaw first molar (tooth 26), the lingual surface of the left lower jaw first molar (tooth 36), the labial surface of the lower left central incisor (tooth 31), and the lingual surface of the lower jaw right first molar (tooth 46) (Greene and Vermillion, 1964, Hiremath, 2011, Tayanin, 2015b).

For the posterior teeth, the first fully erupted molar (first molar) was examined in each quadrant, quadrant I, II, III, and IV. The buccal surfaces of the selected maxillary (upper jaw) molars and the lingual surfaces of the selected mandibular (lower jaw) molars were scored. In the absence of the first molar, this tooth can be substituted by a second or third molar in the same quadrant. For the anterior teeth, the labial surfaces of the maxillary right central incisor (11) and the mandibular left central incisor (31) are scored. In the absence of these anterior teeth, the opposite side of the midline teeth were scored (ex: 21 and 41) (Broadbent et al., 2011).

If a participant did not have a tooth in one of the six segments, that segment was excluded from the OHI-S score. The OHI-S score is calculated as the mean of the debris and calculus scores from the present teeth. The scores and

criteria for debris and calculus assessment are described in Table 3.2 and Table 3.3.

Table 3.2 Scores and criteria for debris assessment (Greene and Vermillion, 1964, Broadbent et al., 2011)

Scores	Criteria for classifying debris
0	No debris or stain present
1	Soft debris covering not more than one-third of the tooth surface
2	Soft debris covering more than one-third, but not more than two-thirds, of the exposed tooth surface
3	Soft debris covering more than two-thirds of the exposed tooth surface

Table 3.3 Scores and criteria for calculus assessment (Broadbent et al., 2011, Greene and Vermillion, 1964).

Scores	Criteria for classifying calculus
0	No calculus present
1	Supragingival calculus covering not more than one-third of the exposed tooth surface.
2	Supragingival calculus covering more than one-third but not more than two-thirds of the exposed tooth surface or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both.
3	Supragingival calculus covering more than two-thirds of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth or both.

This study used plaque disclosing tablet to identify the areas of the plaque and calculus accumulation on the teeth. The scoring guidance is shown in Figure 3.5.

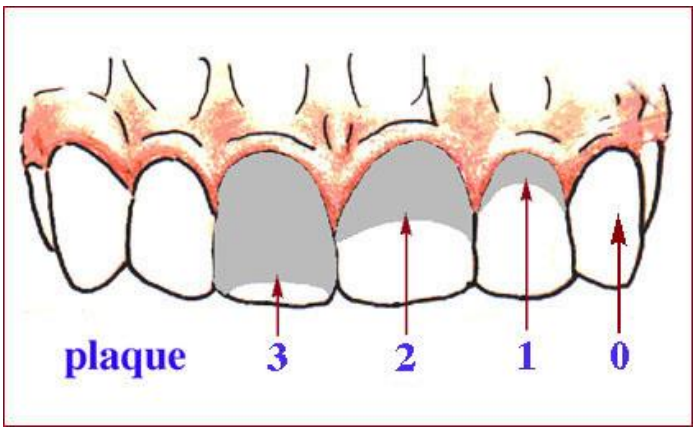

Figure 3.5 Scores (0, 1, 2, and 3) are made based on teeth plaque and calculus conditions (Greene and Vermillion, 1964, Tayanin, 2015b)

Calculation:

1. Debris Index = (buccal + lingual) scores / (total number of examined buccal and lingual surfaces)
2. Calculus Index = (buccal + lingual) scores / (total number of examined buccal and lingual surfaces)
3. Oral Hygiene Index-S = Debris index + Calculus Index

The OHI-S examination result is categorised into good (0.1 - 1.2), fair (1.3 – 3.0), poor (3.1 – 6.0).

3.3.2.3 Periodontal examination

Periodontal probe

Community Periodontal Index of Treatment Needs (CPITN) probe is used to asses periodontal condition. This probe has ball tip and markings at 0.5 mm, 3.5 mm, 5.5 mm, 8.5 mm, and 11.5 mm. The ball tip could minimize tissue trauma and give better detection of irregularities on the root surface (World Health Organization, 2013). CPITN probe used in this research is shown in Figure 3.6.

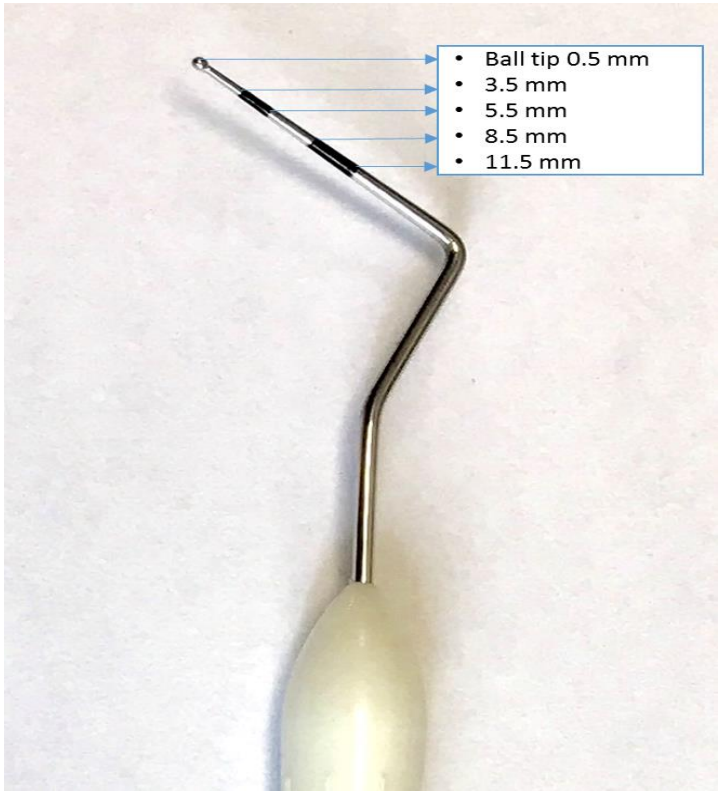

Figure 3.6 Community Periodontal Index of Treatment Needs (CPITN) with a 0.5 mm ball tip and millimeter markings at 3.5 mm, 5.5 mm, 8.5 mm, and 11.5 mm. The instruments are manufactured by UnoDent Ltd.

Periodontal measurement

For periodontal measurement, all teeth in each segment were examined. However, third molars (18, 28, 38, and 48) were excluded from the BPE scores assessment. The segments distribution of the teeth is previously presented in Figure 3.3.

As a periodontal measurement, the highest probing score found by walking the probe round the sulcus of each tooth in each was recorded.

The Basic Periodontal Examination (BPE) as developed by the British Society of Periodontology was used to assess periodontal condition (British Society of Periodontology, 2016). In this research, scores ranged from 0 to 6 according to the depth of the sulcus/pocket. The scores and criteria to assess the periodontal condition are described in Table 3.4.

Table 3.4 Scores and criteria for periodontal condition.

Scores	Criteria for the periodontal condition
0	No pockets >3.5 mm, no calculus/overhangs, no bleeding after probing (black band completely visible)
1	No pockets >3.5 mm, no calculus/overhangs, but bleeding after probing (black band completely visible)
2	No pockets >3.5 mm, but supra or sub-gingival calculus/overhangs (black band completely visible)
3	Probing depth 3.5 -5.4 mm
4	Probing depth 5.5 - 8.4 mm
5	Probing depth 8.5-11.5 mm
6	Probing depth > 11.5 mm
*	Furcation involvement

Both score and furcation involvement were recorded if a furcation detected in the examination. Furcation involvement is the destruction of supporting tissue around bifurcation or trifurcation of multi-rooted teeth (premolar and molar) by periodontal disease (Newman et al., 2012).

General guidance on the interpretation of BPE scores is illustrated in Table 3.5.

Table 3.5 Guidance on interpretation of BPE scores (British Society of Periodontology, 2016)

Scores	Interpretation
0	No need for periodontal treatment
1	Oral hygiene instruction (OHI)
2	OHI, removal of plaque retentive factors, including all supra- and subgingival calculus
3	As for code 2 , root surface debridement (RSD)
4-6	OHI, RSD. Assess the need for more complex treatment; referral to a specialist may be indicated
*	Treat according to BPE code (0-6). Assess the need for more complex treatment; referral to a specialist may be indicated

The probing depth of a clinically normal gingival sulcus in human is 2 to 3 mm (Newman et al., 2012). BPE score of 3 or more indicates periodontitis, thus full periodontal examination need to be carried out. In addition to this, radiographic assessments of the alveolar bone levels must be considered along with the

BPE scores in order to determine the attachment loss (Scottish Dental Clinical Effectiveness Programme, 2014).

This study is a population-based surveillance of periodontitis and not intended to establish periodontitis diagnosis, thus it only focused on the probing depth to categories participants' periodontal condition and did not perform a more detailed periodontal examination.

In order to maximise the value of BPE measurements as an independent variable in the analysis, this study is subdivided the BPE scores to signify participants' periodontal condition as participants who did not have generalised periodontitis and participants who have generalised periodontitis. The threshold for generalised chronic periodontitis used in this study is defined as participants who have 30 per cent sites or more of their remaining teeth affected by periodontitis (probing depth 3.5 mm or more (BPE scores ≥ 3)) (Newman et al., 2012, British Society of Periodontology, 2018).
In addition to this, tooth mobility was examined. Mobility is one of the most visible results from periodontitis due to loss of alveolar bone. Mobility beyond the physiologic range is abnormal and give a sign of periodontal disease (Newman et al., 2012). Table 3.6 describes the mobility categorisation according to the ease and extent of tooth movement as follow (Scottish Dental Clinical Effectiveness Programme, 2014).

Table 3.6 Tooth mobility grade (Scottish Dental Clinical Effectiveness Programme, 2014).

Grade	Descriptions
0	'Physiological' mobility was measured at the crown level. The tooth is mobile within the alveolus to approximately 0.1 – 0.2 mm in a horizontal direction.
1	Increased mobility of the crown of the tooth to at the most 1 mm in a horizontal direction.
2	Visually increased mobility of the crown of the tooth exceeding 1 mm in a horizontal direction.
3	Severe mobility of the crown of the tooth in both horizontal and vertical directions impinging on the function of the tooth.

The tooth mobility clinical outcomes are categorised as follow for the purpose of clinical reporting and statistical analysis in this study:

- Physiological mobility: Participant who has teeth mobility grade 0
- Increased mobility: Participant who has one or more teeth with mobility grade 1, 2, and/or 3.

3.3.3 Semi-structured interview

A semi-structured interview was used to develop the data for this study. An interview is considered the most widely used method to produce qualitative health research data (Green and Thorogood, 2014). Furthermore, this method was chosen to allow participants to talk freely about their personal oral health problems experiences, their views about what is important in oral health, and the extent of their oral health problems. At the same time, semi-structured interview allows me as the researcher and the interviewer to have a set of standardised interview topic questions as a guide to make sure all the interest topics in relation with oral health problems and quality of life can be covered. Topic areas were pre-specified before the interviews conducted. The topic guide was developed based on literature review, ideas and expert opinion from both supervisors, and my own experience as a dentist. A pilot study was performed to assess the effectiveness and appropriateness of the interview topic guide. The participants who involved in the pilot gave feedback regarding the questions in the interview through the self-completion interviewee feedback form. After the questions in the interview topic guide had been revised based on participants' feedback, all the participants were invited again to attend a focus group discussion. This discussion was used to verify any modifications to the topic guide to improve the interview experience for the data collection in Indonesia. The details about the interview topic guide development and the pilot study are presented in *Chapter 4: Pilot study: Development of interview topic guide and questionnaire.* The interview topic guide used for the data collection in Indonesia is attached in Appendix 3.10.

3.4 Participants and sampling design

The background of this research is an urban older population in a developing country. The study used Depok's population as an example background to represent an urban older population in developing countries. Depok is an administrative city on the southern border of the capital city of Indonesia, Jakarta. It is located in the West Java province. Depok as a buffer zone of the capital city, has various urban issues, including increasing population migration from rural areas and other urban areas.

Although United Nations has agreed to set the standard cut off for older people is defined as 60 years old and above (Kowal and Dowd, 2001), there is a variation of the definition of older people between countries. For example, most developed countries have accepted the chronological age of 65 years old and above as a definition of elderly. However, the definition of old age in many parts of developing countries might be constructed not only based on the chronological age, but also affected by the socially constructed meaning of age (Gorman M, 1999). In Indonesia, the local elderly community health centres (*posyandu lansia*) have involved the community who is 50 years old and above in their health promotion programme. Thus, this study used the population of men and women of age 50 years old and above. The study population is men and women of age 50 years old and above. The population aged 50 years old and above in this administrative city in 2015 was 302,086 people (Badan Pusat Statistik Kota Depok, 2016l).

Depok is divided into eleven districts. The percentage of the population aged 50 years old and above in 2015 in each district was vary from 12.74% to 18.11% (Badan Pusat Statistik Kota Depok, 2016l). This research collected the representative data from three districts in Depok which have different socioeconomic (SES) background. Staging of the prosperous family categorisation was used as a surrogate measure of the SES. The selected districts were Beji, Pancoran Mas, and Sukmajaya.

These are the prosperous family staging categorisation based on the Indonesia national population and family planning (Badan Kependudukan dan Keluarga Berencana Nasional, 2011):

- Pre prosperous family: does not meet one of six indicators of family welfare basic needs. The indicators of basic needs are all the family members eat twice a day or more, have different clothes for at home, work /school and travelling, the house occupied by the family has a good roof, floor and walls, have access to health facility, have access to family planning and contraceptive services for adults family members, and all children aged 7-15 years in the family have access to education.

- Prosperous stage 1: able to meet all of six indicators of basic needs, but does not meet one of eight indicators of family psychological needs. The indicators of psychological needs are all the family members have freedom of religions and beliefs, at least once a week all family members eat meat/fish/eggs, able to buy at least a pair of new clothes in a year for all the family members, floor area of at least $8m^2$ for each occupant of the house, the last three months the family is in good health, one or more family members work to earn a living, all family members aged 10 to 60 years are able to read, couples of childbearing age with two or more children are using contraceptive services.

- Prosperous stage 2: able to meet six indicators of basic needs and eight indicators of psychological needs, but does not meet one of five indicators of family developmental needs. The indicators of developmental needs are all the family members have access to increase their religious knowledge, some of the family income is saved in the form of money or goods, family has time to eat together at least once a week, family participate in community activities in the neighbourhood, family has information access through newspapers/magazines/radio/ tv/ internet.

- Prosperous stage 3: able to meet six indicators of basic needs, eight indicators of psychological needs, and five indicators of family

developmental needs, but does not meet one of two indicators of family self-esteem. The indicators of self-esteem needs are family able to donate some of their income for social activities regularly, and there are family members who are active as administrators of social associations/community institutions.

- Prosperous stage 3 plus: able to meet six indicators of basic needs, eight indicators of psychological needs, five indicators of family developmental needs, and two indicators of family self-esteem.

Table 3.7 presents the number of population aged 50 years old and above in 2015 in each district, number of health centres, and percentage of the staging of prosperous family by district based on the Statistics Depok City's publications in 2016.

Table 3.7 Population aged 50 years old and above in 2015, number of health centres, and percentage of the staging of prosperous family by district. This PhD data collection was conducted in three districts of Depok (Beji, Pancoran Mas, and Sukmajaya) (Badan Pusat Statistik Kota Depok, 2016l, Badan Pusat Statistik Kota Depok, 2016a, Badan Pusat Statistik Kota Depok, 2016j, Badan Pusat Statistik Kota Depok, 2016f, Badan Pusat Statistik Kota Depok, 2016b, Badan Pusat Statistik Kota Depok, 2016c, Badan Pusat Statistik Kota Depok, 2016d, Badan Pusat Statistik Kota Depok, 2016e, Badan Pusat Statistik Kota Depok, 2016g, Badan Pusat Statistik Kota Depok, 2016h, Badan Pusat Statistik Kota Depok, 2016i, Badan Pusat Statistik Kota Depok, 2016k).

Districts	Number of population			Number of health centres	Percentage of the pre-prosperous and prosperous stage 1 family	Percentage of the prosperous family stage 2, 3, and 3 plus family
	50+ years old	Total Population in the district	% 50+ years old			
Sawangan	17041	149695	12.56	4	16.44	83.56
Beji	**27238**	**200975**	**13.55**	**3**	**10.31**	**89.69**
Bojongsari	15571	120818	12.89	2	17.66	82.34
Cilodong	19850	151441	13.11	3	13.92	86.08
Cimanggis	41704	293132	14.23	6	8.57	91.43
Pancoran Mas	**40088**	**255016**	**15.72**	**3**	**18.23**	**81.77**
Cipayung	19744	154958	12.74	2	19.82	80.18
Sukmajaya	**50966**	**281418**	**18.11**	**4**	**31.82**	**68.18**
Tapos	35090	261923	13.40	6	17.66	82.34
Limo	13076	106545	12.27	1	10.64	89.36
Cinere	19959	130178	15.33	1	13.02	86.98

3.4.1 Participant recruitment and sampling design for quantitative data collection

The following inclusion and exclusion criteria were applied to recruit participants for this quantitative data collection. The data collection (oral health examination and questionnaire completion) was conducted at local elderly health centres (*posyandu lansia*) in Beji, Pancoran Mas, and Sukmajaya districts.

As the inclusion criteria, subjects were accepted as participants of the quantitative data collection if they could meet the following requirements:

- Participants are native Indonesian adults of age 50 years old and above currently living in Depok.
- Participants are able to participate in the questionnaire completion and oral health examination. In the event that participants could not read the questionnaire, community health worker read every question for the participants.
- Participants are able to provide consent.
- Participants have at least one natural tooth in her/his mouth.

As the exclusion criteria, subjects were not accepted as participants if:

- Subjects are unable to provide consent.
- Subjects are not an Indonesian citizen who lived in Depok city.
- Participants do not have any natural teeth left in her/his mouth (edentulous).

Sample size determination

Prior to the data collection in February to May 2018, there was no published prevalence of periodontal disease in Indonesia. Indonesia national basic health research survey was conducted in 2007 and 2013. These basic health survey covered health services and access, pharmaceuticals and traditional health care, environmental health, health expenses, communicable disease, non-communicable disease, reproductive health, baby and children health, and oral health. The oral health survey assessed various indicator of an oral health condition, such as oral health effective medical demand, tooth brushing behaviour, and DMF-T index. However, these basic health survey did not assess the prevalence of periodontal disease due to the limitation in providing a specific dental instrument for measuring periodontal condition, Clinical Community Periodontal Index of Treatment Needs (CPITN-C) probe (Badan Penelitian dan Pengembangan Kesehatan, 2007, Badan Penelitian dan

Pengembangan Kesehatan, 2013b). Thus, the probability of periodontitis in another Southeast Asia country which has a close relation, and similarity in cultural and health background was considered in the calculation of the sample size for this research. The probability which was used as an estimation of the probability of periodontitis in Depok was the probability of periodontitis in Malaysia based on their national oral health survey in 2010. Table 3.8 presents the periodontal health data from the National Oral Health Survey of Adult (NOHSA) conducted in Malaysia in 2010 (World Health Organization, 2010).

Table 3.8 Periodontal country profile data from the National Oral Health Survey of Adult (NOHSA) conducted in Malaysia in 2010 (World Health Organization, 2010).

Age group	Number of dentate	% persons who have as highest score				
		0	1	2	3	4
		No disease	Bleeding on probing	Calculus	Probing depth 4-5 mm	Probing depth 6+ mm
35-44	2966187	2	2	36	35	25
65+	759220	3	2	32	33	30

This PhD research used the probability of periodontitis in the age group 65-year-old and above in Malaysia as an estimation for sample size calculation: 63 % (probing depth ≥ 4mm).

The following formulas were used to determine the minimum required sample size for this study(Lemeshow et al., 1990)

1. Simplified sample size calculation for sample survey

$$n = \frac{(z_{1-\alpha/2})^2 \, P \, (1-P)}{d^2}$$

2. Sample size calculation for stratified random sampling

$$= \frac{(z_{1-\alpha/2})^2 \sum_{h=1}^{L} N_h^2 P_h(1-P_h)/w_h}{N^2 d^2 + (z_{1-\alpha/2})^2 \sum_{h=1}^{L} N_h P_h(1-P_h)}$$

The population is divided into “L” strata in the stratified random sampling, and random samples are selected from each of the strata. The L strata of this study refer to the number of districts involved in the data collection of this study, which was three districts in Depok. “***h”*** refers to the stratum of the study population consists of Beji, Pancoran Mas, and Sukmajaya as the districts where data collection were conducted.

These are the details of denotations in the formula:

- n : Sample size
- $z_{1-\alpha/2}$: "Z value" for the desired level of confidence. In this study, the desired level of confidence level was 95 % (critical value z: 1.96).
- *P:* Probability of periodontal disease, which was 63%. This study used probability of periodontal disease from the previous study in Malaysia described above as an estimation.
- P_h: Probability of individuals in each stratum *h* who have periodontal disease. The probability of periodontal disease from the previous study in Malaysia was used as an estimation, which was 63 %.
- d: Precision. The precision used was 0.05
- N_h: Population in stratum *h*
- N: Total population
- w_h: The fraction of observations allocated to stratum h. Proportional allocation is used for this research, thus $W_h = N_h/N$ for each stratum. Number of the population aged 50 years and above for each district (stratum) can be found in table 3.7.

The required sample size based on the above sample size calculation formula:

	Based on simplified sample size calculation for sample survey	**Based on sample size calculation for stratified random sampling for population in Beji, Pancoran Mas, and Sukmajaya**
If P = 0.63, confidence level 95%; and relative precision 5%	$\frac{(1.96)^2 \times (0.63 \times 0.37)}{(0.05)^2}$ = 358.19 ≈ 359	$\frac{(1.96)^2 \times 3261767662}{(118292)^2\,(0.05)^2 + (1.96)^2(48798.5526)}$ = 356.2815391 ≈ 357

The outcomes from the two formula assumed in the above table are very similar. This PhD research used the larger value, which was the one based on the simplified sample survey calculation.

Assuming that the probability of periodontitis in the age group 50-year-old and above in Indonesia is around 63 % and confidence level is 95%, then the likely range of sample size needed for this research data collection was around 359.

The Indonesian government conducted a national basic health survey which includes periodontal examination in 2018 and published the results in early 2019. The national periodontitis prevalence for 55-64 years age group and 65 and above age group were 75.9 and 66, respectively (Badan Penelitian dan Pengembangan Kesehatan, 2019).

As a comparison to the previous sample size calculation which was done prior to the data collection, the sample size calculation based on the recent publication of Indonesia's national basic health survey 2018 was done as below:

	Based on simplified sample size calculation for sample survey	**Based on sample size calculation for stratified random sampling for population in Beji, Pancoran Mas, and Sukmajaya**
If P = 0.759, confidence level 95%; and relative precision 5%	$\frac{(1.96)^2 \times (0.759 \times 0.241)}{(0.05)^2}$ = 281.08 ≈ 282	$\frac{(1.96)^2 \times 2559585067}{(118292)^2\,(0.05)^2 + (1.96)^2(38293.36097)}$ = 279.9 ≈ 280
If P = 0.66, confidence level 95%; and relative precision 5%	$\frac{(1.96)^2 \times (0.66 \times 0.34)}{(0.05)^2}$ = 344.82 ≈ 345	$\frac{(1.96)^2 \times 3140028586}{(118292)^2\,(0.05)^2 + (1.96)^2(46977.2424)}$ = 343.05 ≈ 344

This study recruited 369 participants who responded to the invitation of the study. There were 363 participants met the inclusion criteria and six of them did not meet the inclusion criteria, thus this number of participants were sufficient for the study even after we have obtained the periodontitis prevalence based on the recent national health survey which was published after the time frame of this study data collection.

The community health workers invited 582 urban older people registered with 12 elderly community health centres (*posbindu*), which located in 12 sub-district in Depok. The gender proportion of the urban older people invited for this study was 63.2 per cent women and 36.8 per cent men.

This study recruited 369 participants who responded to the study invitation. There were 363 participants met the inclusion criteria, and six of them did not

meet the inclusion criteria. This number of participants were sufficient for the study even after we have obtained the periodontitis prevalence based on the recent national health survey, which published after the time frame of this study data collection.

The participation response rate of this study was 63.4 per cent, which means 369 people participated in this quantitative data collection. There were 253 female (68.6%) and 116 male (31.4%) participants involved in the study. The average age of the urban older people who participated in this study was 66.62 year. On the other hand, the average age of those who were not willing to participate in the study was 65.9 years old with a gender proportion of 46 per cent and 54 per cent for men and women, respectively.

The rate ratio of the response rate was calculated to examine whether the proportions of male and female participated in the study were similar to the proportions of male and female in the population reference. The 95% confidence interval (CI) for the rate ratio of the number of female in the study compare to the population is 94.56-122.41. The lower confidence limit is less than 100, and the upper limit is above 100, which indicates that there is no significant difference between the number of female in the sample and the number of female in the reference population. The 95% confidence interval (CI) for the rate ratio of the number of male in the study compare to the population is 71.06-99.8. The lower confidence limit is less than 100, and the upper limit is slightly lower than 100, this indicates the proportion of male in the sample was slightly less than the number of male in the reference population. These rate ratio results have potentially explained the gap between 582 older people invited, and 369 responded to the invitation. There was less proportion of the male agreed to take part in the study than the male in the reference population, and this might be caused by some of them were still working and did not have any time available to come to the data collection day. Another potential explanation to the gap is the possibility that the older people who had some severe health problems were reluctant to participate in the study.

3.4.2 Participant recruitment and sampling design for qualitative data collection.

This qualitative study used stratified purposeful sampling to select participants to be interviewed to capture both similarity and major variations in participants (Palinkas et al., 2015). The interviewees were selected based on their periodontal condition, gender, level of education, and age. This information was obtained from the quantitative data collection, oral health examination and questionnaire, which was done prior to the interviewees' selection.

There were four elderly community health centres which agreed to take part in the qualitative data collection which located in three districts of Depok, which are Sukmajaya, Pancoran, and Beji. Thus, the data of the older people participated in the quantitative data collection from those four community health centre were screened to get a list of participants with generalised periodontitis. There were 87 older people had generalised periodontitis from a total of 124 older people participated in the quantitative data collection from the four elderly community health centre.

The community health workers received the list of 87 potential participants' names to be contacted to participate in qualitative research as interviewees. Fifty-five older people approached by the community health workers confirmed their willingness to contribute as the interviewees for the qualitative data collection. Then the researcher made a list of order priority selection participants to be interviewed to accommodate major variations in participants. The selection order of the participants was based on the stratified purposeful sampling mentioned above, which not only consider the generalised periodontitis diagnose of the participants, but also take account of the balanced proportion of the major variations, such as gender, level of education, and age. These variations were considered in the selection of the participants as these variations may affect their views toward periodontal disease experiences.

The researcher worked with the community health workers to schedule the interviews. Then, the consent process was conducted for each participant

before the interview was held. The researcher did not interview all the fifty-five potential interviewees as the data had reached thematic saturation before all the people on the selection list interviewed. The data collection was stopped after the researcher gathered data from 32 participants. The details about the thematic saturation obtained for this study are reported in section 6.4 pp. 143 –144.

The interviews were held at the local elderly community health centre (*posbindu*). All of the interviewees were familiar with the community health workers and the location of the *posbindu*. All interviews took place in a room with a non-clinical setting in *posbindu*. The room had been prepared to give a friendly and relaxed setting. In addition to this, there were finger foods and drinks prepared for the interviewees as well. Each interviewee came based on the schedule which had been agreed prior to the interview at their convenience time. The stages of the data collection are illustrated in Figure 3.7.

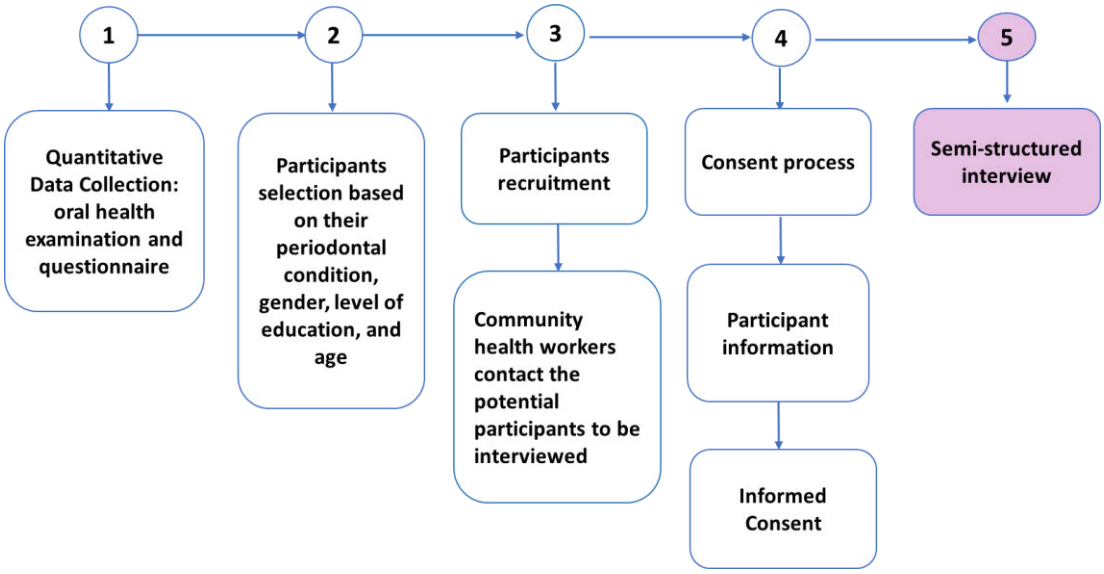

Figure 3.7 Qualitative research data collection stages.

Sample size

Many qualitative researchers consider that it is impossible to give a predetermined number of sample participants for qualitative study (Magnusson, 2015). The common general rule is that sampling stops when data collection under a study has reached saturation (Kuper et al., 2008). However, there are no strict practical guidelines for estimating sample size needed to reach adequacy of data saturation (Guest et al., 2006, Morse, 1995, Charmaz, 2014).

Qualitative researchers have tried to estimate the sample sizes required to obtain data saturation. Mason attempts to examine the sample sizes and saturation in PhD studies using qualitative interviews in Great Britain and Ireland universities from 1716 until 2009. The results from this study show the median and mean of sample sizes to achieve saturation were 28 and 31, respectively, from 560 studies analysed with a various methodological approach (Mason, 2010). The results from Mason (2010) study is presented in Table 3.9.

Table 3.9 Descriptive statistics from 560 qualitative studies with a various methodological approach.

Total number of qualitative research studies	Range of sample size		Measures of central dispersion			
	Lowest	Highest	Mode	Mean	Median	Standard Error
560	1	95	30	31	28	0.79

Guest and colleagues (2006) suggest that 6 to 12 participants are a potential adequate sample to reach a point of saturation on a relatively homogenous study population. Their study reported that the first six interviews elicited 80 out of 109 important codes (73 %), then the next six interviews identified an additional 20 codes which means that 92 % of the important codes are derived from the first 12 interviews. The term of point saturation in their study is described as when there is no new information from qualitative data analysis

which could change the codebook from previous participants (*categories* saturation) (Guest et al., 2006).

The data collected in this study followed the proposed principles by Francis and colleagues to achieve *thematic* categories saturation. This principle used is to stop data collection when thematic saturation has been achieved. These are the details of the principles adopted in this research for specifying saturation in themes (Francis et al., 2010):

- Ten interviews were conducted as initial samples. These initial samples were analysed for emerging themes before conducting the next interviews.
- Francis et al. suggested continuing a data collection until three further sequential interviews have not brought new themes. To be more conservative, this study continued to collect data until five further sequential interviews did not elicit new themes.
- The thematic coding was conducted by two independent coders, and agreement levels reported.
- Data saturation methods and findings are reported.

The interview topic guide was used in each interview. Given the nature of the qualitative study, the topic guide allows some flexibility for unanticipated issues based on the response from the interviewees. These unanticipated issues were explored with the participant and the subsequent next participants where applicable.

Inclusion and exclusion criteria

The following inclusion and exclusion criteria were applied to recruit participants to be interviewed.

As the inclusion criteria, subjects were accepted as participants in the interviews if they could meet the following requirements:

- Participants are native Indonesian adults of age 50 years old and above currently living in Depok.
- Participants are able to participate in the interview arranged at a time convenient for them.
- Participants are able to provide consent.
- Participants have generalised chronic periodontitis with a range of BPE score 3 and above.

As the exclusion criteria, subjects were not accepted as participants in the interviews if:

- Subjects are unable to comply with the instructions for the interview session.
- Indonesian is not a subject's native language
- Subjects are unable to provide consent.
- Subjects are not an Indonesian citizen.

3.5 Calibration between the dental examiners

Prior to the oral health examination for the research data collection, calibration between dental examiners was performed. Three dental examiners performed the calibration and oral health examination for quantitative data collection. The calibration involved nine older people as participants, with each subject being seen by all the examiners. Interrater reliability was assessed using *Fleiss's Kappa* (World Health Organization, 2013).

The oral health examination calibration included the Decayed, Missing and Filled Teeth Index (DMF-T) and periodontal status assessment.

For the calibration purpose, the DMF-T was categorised into a very low group (DMF-T score < 5), a low group (DMF-T score: 5 – 8), a moderate group (DMF-T score 9–13), and a high group (DMF-T score > 13). Periodontal status was categorised into two groups, not having chronic generalised periodontitis and having chronic generalised periodontitis.

The threshold for generalised chronic periodontitis used in this study was defined as participants who have more than 30 per cent sites of their remaining teeth affected by periodontitis (probing depth 3.5 mm or more (BPE scores ≥ 3)) (British Society of Periodontology, 2017, Newman et al., 2012).

Based on the Fleiss's Kappa test, there was an almost perfect agreement between the three dentists examiner for the DMF-T measurement. The DMF-T percentage agreement was 100 % (95% CI = 71.69 – 100), $\kappa = 1$, $p < 0.001$. The Fleiss's Kappa agreement for periodontal status showed moderate agreement between the three dentists examiner, and the percentage agreement was 67% (95% CI = 29.93 – 92.51), $\kappa = 0.5$, $p < 0.0047$.

3.6 Data analysis

The details of the data processing and analysis for both quantitative and qualitative data are described in the sub-sections below.

3.6.1 Quantitative data analysis

3.6.1.1 Outcome of the interest and explanatory variables

Short form of the Oral Health Impact Profile (OHIP-14) was used as a measurement instrument to assess the oral health-related quality of life. The OHIP-14 provides urban older people self-assessment toward oral health condition which has relation with quality of life. These are the details of the outcome of interest/response variables based on the OHIP-14 data:

- *Severity of impact*

The severity of the impact measured by the total OHIP score (sum of the Likert-type responses for the fourteen OHIP questions). The range of the total scores may vary from 0 to 56.

The focus of the analysis is to examine the relationship between predictor variables and the severity of the impact on quality of life. The predictor variables are demographic variables, socioeconomic variables, behavioural

and systemic disease variables, oral health condition variables, and subjective appraisal variable.

- *Extent of impact*

The extent of impact refers to the number of OHIP items experienced 'fairly often' or 'very often'. There are 14 items in the OHIP questionnaire. The range of the total extent of impact may vary from 0 to 14.

The focus of the analysis is to assess the relationship between predictor variables and the extent of the impact on quality of life. The explanatory variables are demographic variables, socioeconomic variables, behavioural and systemic disease variables, oral health condition variables, and participants 'subjective appraisal toward their oral health variable.

- *Prevalence of impact*

Prevalence of the impact refers to the proportion of individuals who reported one or more OHIP's items as "fairly often" or "very often". This outcome variable is categorised into two categories: "No impact on quality of life" and "Has an impact on quality of life". Participants with one or more OHIP's items experienced 'fairly often' or 'very often' is categorised into "Has an impact on quality of life" group, while participants who did not experience at least one OHIP's item as 'fairly often' or 'very often' is categorised into "No impact on quality of life" group. The predictor factor of interest is the periodontal condition which includes periodontal status, furcation status, and teeth mobility status.

The explanatory variables include participants' background information, such as demographic, socioeconomic, behavioural and systemic disease, their subjective appraisal about their health, and oral health examination results.

The details about the explanatory variables are expressed below:

- *Age*

  The study population of this research is men and women of age 50 years old and above. This variable is categorised into a dichotomous variable: 50-64 years and 65 years and above

- *Gender*

  This variable is a dichotomous variable: man and woman.
- *Marital status*

  This variable is categorised into a binary variable: “single, divorced and widower” group and “married” group.
- *Educational background*

  This variable is categorised into six categories: never attended formal school; not completed elementary school; elementary school; junior high school; high school and vocational school; and college and university.
- *Family income*

  This variable is categorised into two categories: minimum wage and under (Up to Rp. 3.500.000) and more than minimum wage.
- *Smoking status*

  This variable is categorised into three categories: never smoke, former smoker, and active smoker.
- *Diabetes status*

  This variable is a dichotomous variable: no diabetes and diabetes.
- *Diabetes time duration*

  This variable is categorised into three categories: no diabetes, 10 years and below, and more than 10 years.
- *Brushing habits*

  This variable is a binary variable: brushing at least two times a day and brushing less than two times a day.
- *Pattern of a dental visit*

  This variable is a dichotomous variable: routine dental check-ups at least once a year and not having routine dental check-ups.
- *Decayed, Missing and Filled Teeth Index (DMF-T)*

  This variable is a dichotomous variable: very low to low (DMF-T score: 0 – 8) and moderate to high (DMF-T score: 9-32).
- *OHI-S*

  This variable is categorised into three categories: good (OHI-S score: 0.1 - 1.2), fair (OHI-S score: 1.3 – 3.0), poor (OHI-S score: 3.1 – 6.0).

- *Furcation status*

  This variable is a dichotomous variable: not having teeth with furcation involvement and having teeth with furcation involvement.
- *Mobility status*

  This variable is a binary variable: physiological mobility (normal condition) and having teeth with increased mobility.
- *Periodontal status*

  This variable is a dichotomous variable: not having chronic generalised periodontitis and having chronic generalised periodontitis.
- Subjective appraisal of dental health

  This variable is merged into three categories: very good and good group, fair group, and bad and very bad group.

3.6.1.2 Statistical methodology

Descriptive statistics were calculated to describe the characteristic of the sample and the research outcome of interest (prevalence, severity, and extent of impact based on the OHIP-14 data).

Chi-square for independence test was performed to examine the relationship between two categorical variables, which were prevalence of the impact and periodontal condition (periodontal status and teeth mobility status). Odds ratio was calculated to measure the odds of the outcome event (prevalence of the impact) between the groups of the periodontal condition.

Periodontal status, mobility teeth status, and furcation involvement status as independent variables are dichotomous variables. The outcome measurement is the prevalence of the impact based on the OHIP-14 data. An additional Chi-square for independence test and odds ratio (OR) was performed based on the prevalence of impact according to seven domains of OHIP. This test was only performed for periodontal condition variables which have statistically significant differences between the prevalence of impact based on the OHIP score. This additional test was used to compare the baseline of the

participants' periodontal condition between the prevalence of impact for each domain of the OHIP. There are seven domains of the OHIP: functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap. Pearson Chi-square p-value was reported when the expected frequencies in each cell are greater than five. Fisher's exact probability test value was reported when cells have expected frequencies of less than 5 (Pallant, 2016).

Histogram, absolute skew value, absolute kurtosis value, box and whiskers plot, Kolmogorov-Smirnov statistic, Shapiro-Wilks test, and Q-Q plot were performed for the severity of impact scores to assess normality of the distribution.

The general assumptions of the parametric tests were checked before performing the parametric tests. *Levene's* test for equality of variance was performed to assess the homogeneity of variance. Independent t-test and one-way analysis of variance (ANOVA)/ *Kruskal-Wallis* were used to analyse the severity of impact (total OHIP score) according to the predictor variables (demographic, socioeconomic, behavioural and systemic disease, subjective appraisal about oral health, condition, and oral health condition). The independent t-test was performed where there were two groups of the independent variables. Dependent variable residuals normality in each group of the independent variables were checked before performing the one-way analysis of variance (ANOVA) or *Kruskal-Wallis* test. An ANOVA test was performed when there were more than two groups of the independent variables, evidence of the residuals normality distribution, and no evidence of a violation to homogeneity of variance assumptions. In addition to this, Post-hoc test was conducted when there is a statistically significant result of the test to obtain information which of the groups are statistically significantly different from one another. *Kruskal-Wallis* test was performed when there were more than two groups and there were evidence of violation to the residuals normality distribution. Furthermore, a *Jonckheere-Terpstra* test for ordered alternatives was conducted to determine if there was a statistically significant trend

between the independent variables and the dependent variable of interest (severity of impact score).

The general assumptions of the non-parametric tests were checked before performing the non-parametric tests. Mann-Whitney U test and Kruskal Wallis test were used to analyse the extent of impact score according to the predictor variables (demographic, socioeconomic, behavioural and systemic disease, subjective appraisal about oral health, condition, and oral health condition). Mann-Whitney U test was performed to test for differences of the extent of impact score between two groups of a categorical variable. Kruskal Wallis test was performed to test for differences of the extent of impact score between three or more groups of categorical variable.

In addition to this, a *Jonckheere-Terpstra* test for ordered alternatives was conducted to determine if there was a statistically significant trend between the independent variables and the dependent variable of interest (extent of impact score). Furthermore, the effect size (r) proposed by Cohen was calculated as an objective and standardized measure of the magnitude of the association (Rosenthal, 1991). The categorisation of the effect size interpretation is divided as small effect size ($r \leq 0.1$), small to medium effect size ($0.1 < r \leq 0.3$), medium to large effect size ($0.3 < r \leq 0.5$), large effect size ($r > 0.5$) (Pallant, 2016, Field, 2013).

3.6.2 Qualitative data analysis

3.6.2.1 Style of analysis

This study was analysed using an inductive process where themes and explanations were derived primarily from reading the transcribed interviews comparing one with another.

A thematic content analysis was used to identify the key issues in participants' accounts by looking for patterns, or emerging themes in these data. The outcome from this approach is a summary of the worldviews of participants

(Green and Thorogood, 2014). This study focuses on obtaining thematic saturation. The result from this study is to expand the quantitative findings and gain a deeper understanding about how periodontal disease and other oral health problems may affect older people quality of life in a natural setting.

3.6.2.2 Data processing and analysis

As the initial step of data processing, all the interviews were recorded on a digital recorder. Then, the audio recordings were transcribed verbatim.

The analysis follows these steps, including *data familiarizing, initial coding,* and *focused* themes *coding* (Green and Thorogood, 2014, Charmaz, 2014, Braun and Clarke, 2006). As the first step is *data familiarizing*, the researchers listened to the audio recordings and read each transcription carefully to get the closeness with the data. This step allows the researchers to see the range of participants' experiences regarding oral health problems, oral health services, their views about the oral health-related quality of life, and the impact of oral health problems to their well-being. Moreover, the researchers also paid more attention to the various problems related to periodontal disease.

The next step was *initial coding* where the data were explored segment by segment of text for the potential emerging themes. The researchers considered any regularities within the data and asking themselves 'What is the segment of text about?', 'What are the similarities and the differences of this segment with the other segments?', 'What does the data suggest?', 'What are the oral health problems mentioned by the participants?', 'What do participants think and feel about their oral health problems, particularly periodontal disease?', How participants' react to their oral health problems?', 'What are the consequences from their actions?', and 'What are the implications of oral health problems for their quality of life?'. This step is a repetition and comparison process which was done within the participant's transcriptions and between participants' transcriptions.

Focused themes coding was the third coding process. This step requires decisions to identify the most significant and frequent *initial coding*. This step

aims to sort and categorise the large amounts of data from the participants' transcriptions. The earlier codes were edited and merged when necessary. Then, the most significant and frequent coding were collected into relevant themes. This step involved ongoing analysis to refine and identified the themes and sub-themes. Furthermore, researchers were able to return to each participants' transcriptions and explore participants' oral health experiences, their reaction to their oral health problems and how they have maintained their oral health, and their interpretation and views regarding oral health-related quality of life. This step allowed researchers to compare the data horizontally within the participant and vertically between participants.

Careful attention was given through the process of the data coding to achieve the closeness with the data being studied and to understand participants' reaction toward their oral health problems, stories, perceptions, and views regarding oral health-related quality of life and periodontal disease. The researchers have tried to see the world through participants' eyes and to understand the logic behind participants' experiences.

The two researchers who did the coding for the interviews are native Indonesian. The first coder is the PhD student who conducted the interviews. The second coder is a lecturer in Prosthodontics Department, Faculty of Dentistry, Universitas Indonesia. The first coder used software for qualitative data *NVIVO 10* to do the coding process, while the second coder did the coding manually without qualitative software. The data coding themes findings were undertaken independently.

After these two researchers had finished the data analysis process, a table of thematic findings comparison between two outcomes was made. All the themes and sub-themes were translated from Indonesian into English. Then, both coders discussed the themes and sub-themes identified from the interview transcriptions, particularly when there were any discrepancies between the two coders and when there were themes which need to be compared or combined. At the end of the discussion, both coders have

achieved an agreement of the final themes findings, which are presented in Chapter 6.

3.6.2.3 Coping strategies of interviewing in Indonesian and translating themes findings in English

The interviews in this study were conducted in Indonesian. Thus, careful attention was given by both researchers who did the coding of the themes to overcome the challenges of translation in data coding and quotes presented in the qualitative study report.

There were three coping strategies used by the researchers:

- Both researchers did the themes and sub-themes coding in the original language of interview transcriptions, Indonesian. This step was taken to avoid losing the original meaning and natural setting of the worldviews of the participants regarding their perceptions and experiences with their periodontal disease and how this disease may affect their quality of life. Both themes coders are native Indonesian. Thus they have knowledge about linguistic and cultural affiliation to understand the contexts interviewees speaking without the need of an interpreter.
- After both coders agreed on the final themes and sub-themes to be presented for the qualitative study, the first coder translated the themes and sub-themes from Indonesian into English. Then the first coder reported the translation to the second coder to be discussed. The second coder has extended experience in data collection with Indonesia as research background. In addition to this, she also has knowledge of English-speaking culture. Any problematic words were consulted with the second coder. Then, the final agreement of the themes and sub-themes in English are reported in this study. The final themes and sub-themes agreement in English can be seen in details in the appendices 6.2 and 6.3..
- The quotes used as illustrations of the themes and sub-themes of this study were translated from Indonesian into English. Any challenges or problematic words in the quotes translations were also discussed by both coders.

Chapter 4 Development of interview topic guide and questionnaire to be used in Indonesian population

The pilot study involved both semi-structured qualitative interviews and the completion of a quantitative questionnaire to determine whether these tools developed for the purpose of this study were “fit for purpose”. In addition to this, a group discussion was held to verify instruments that were modified based on the feedback from the participants. The group discussion was also used to verify the themes findings from the interviews. The pilot was conducted in Edinburgh and recruited Indonesian nationals who currently live in Edinburgh. This pilot study was conducted prior to the PhD data collection in Depok, Indonesia.

Ethical approval for this study was obtained on 22nd August 2016 from the Ethics Review Committee Centre for Population Health Sciences, the University of Edinburgh. The ethics approval letter for the pilot study is presented in Appendix 4.1. The initial part of the pilot was conducted on 9th to 23rd September 2016 at the Edinburgh Dental Institute which involved interviews and questionnaire completion. There were seven participants in this initial phase, four female and three male. The group discussion as the second phase of the pilot was held on 16th December 2016. Six out of seven participants from the first phase attended this discussion (four female and two male participants).

4.1 Aim

The aim of this pilot study was:

1. To test the interview topic guide and questionnaire so that the researcher could assess the effectivity and appropriateness of the questions in the instruments before conducting the PhD research data collection in Indonesia.

In addition to this, qualitative data themes coding of the pilot data was done to find emergence themes from the interview transcriptions. However, this pilot was not intended to pursue thematic saturation. The main purpose of this study is to test the interview topic guide and questionnaire as mentioned above.

4.2 Research instruments and methodology

The interview topic guide and questionnaire had been developed as instruments for the PhD project. The topic guide was developed based on a literature review, ideas and expert opinion from both supervisors, and the researcher's own experience as a dentist.

The structure of the interview topic guide in this study was a *tree-branch structure*, where the potential issues related to periodontal disease experiences were divided into topics. Each interview topic had several sub-topics. The main question presented under each sub-topic. These main questions had a logical sequence to ensure smooth transitions between the main questions for the interviewees. During the interview, the researcher attempted to use all the main questions, and follow-up questions/prompts with each participant to obtain the same degree of depth and detail.

There are four topics used in the interview topic guide of this pilot study:

- Information and knowledge regarding oral health
- Experience of oral/dental problems
- Experience of dental health services
- Harmful habits to oral health

The interview topic framework is illustrated in Figure 4.1.

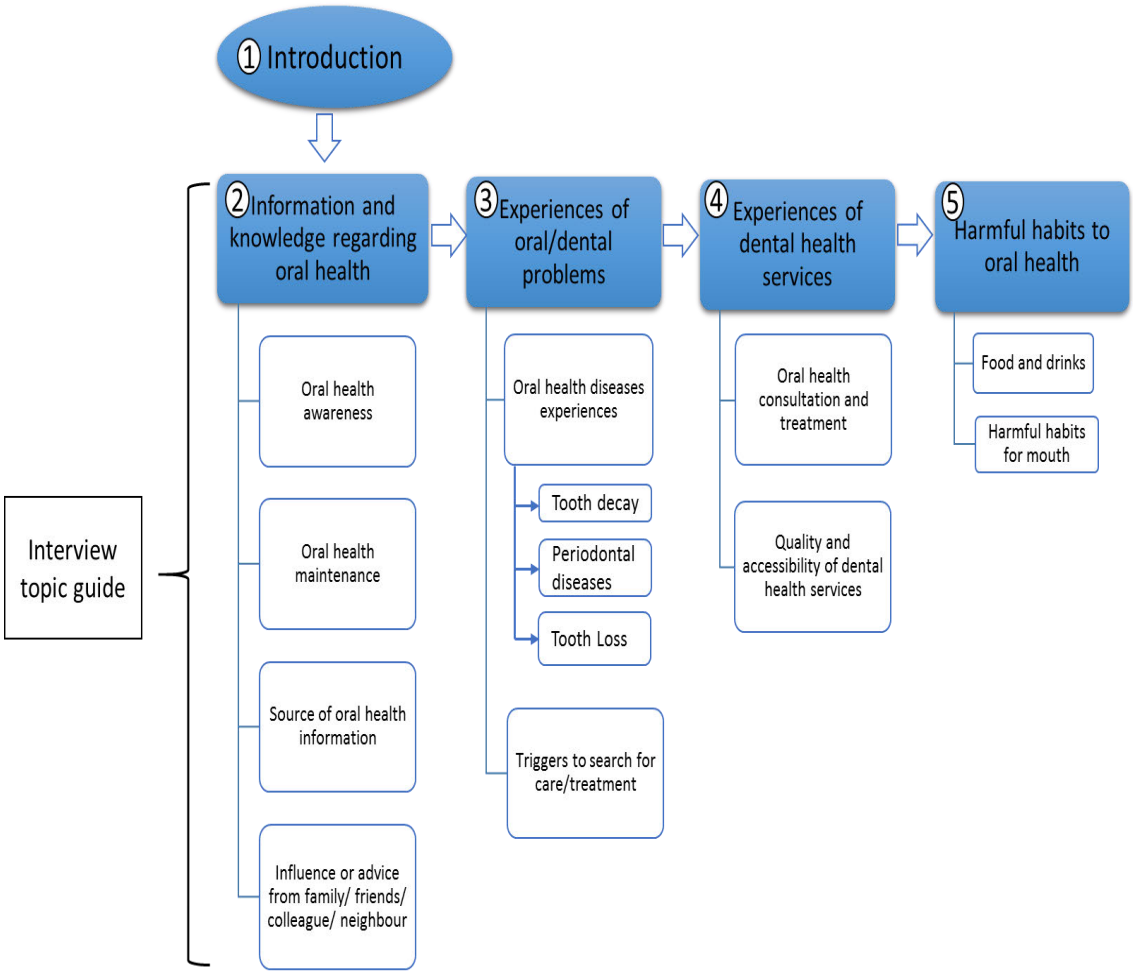

Figure 4.1 Interview topic guide scheme.

The introduction in Figure 4.1 gives a brief description of the research. This part was followed by the interview topic guide. In the interview topic guide, there were main questions, prompts and probes. The main questions gave information about participant's overall experience and understanding but might not provide the necessary depth of explanations to understand the relationship between quality of life and periodontal disease experienced by the participants.

Prompts and probes for each of the main questions were intended to provide a better and deeper understanding of the participant's answers (Rubin and Rubin, 2005). Prompts were direct follow-up questions to be used to encourage participants to expand their response. Probes were responses to be vigilant for during the interview with participants. If these probe topics were

not mentioned by participants, then they would not be pursued in that section of the interview. The interview topic guide of the pilot study was presented in Appendices 4.2 and 4.3 in English and Indonesian, respectively.

The questionnaire in this pilot study contains questions about the participant's socioeconomic background, demographic background, their behaviours related to oral health, and the participant's perceptions regarding their general and oral health. In the data collection in Depok (Indonesia), this questionnaire was used as a part of quantitative research instruments together with oral health examinations. The pilot study questionnaire is shown in Appendices 4.4 and 4.5 in English and Indonesian, respectively.

The interview topic guide and questionnaire (instruments) had been translated forward and backwards before conducting the pilot study. WHO suggests that forward-translations preferably are translated by a health professional, while the backwards-translations are conducted by an independent translator who has no knowledge of the area covered by the instrument (World Health Organization, 2016).

In this pilot, the forward-translations from English to Indonesian had been done by the author, who is a dentist and familiar with dental public health and medical terminology. The PhD student who acted as a forward translator has knowledge of English-speaking culture, and her mother tongue is Indonesian.

The backward translations from Indonesian to English had been done by a translator who has no knowledge of dental public health nor medical background. The backward translator is an Indonesian PhD student at the University of Edinburgh with the educational background in science and engineering. Furthermore, the backward translator has knowledge of English-speaking culture.

The emphasis in these forward and backward translations was on conceptual and cultural equivalence and not linguistic equivalence. The problematic words or phrases which occurred during the forward-backwards translations were

reported to the PhD supervisors. Any discrepancies between the forward-translations and the backwards-translation had been discussed by the principal supervisor, the second supervisor, and the PhD student. A consensus on any discrepancies in forward-backwards translations had been reached prior to the pilot, and the instruments were subsequently refined further after the pilot for the data collection in Depok.

The overall design of the pilot involved five stages: participant recruitment, consent process, interviews and questionnaire completion, transcribing and analysis, and group discussion session. These stages are illustrated in Figure 4.2.

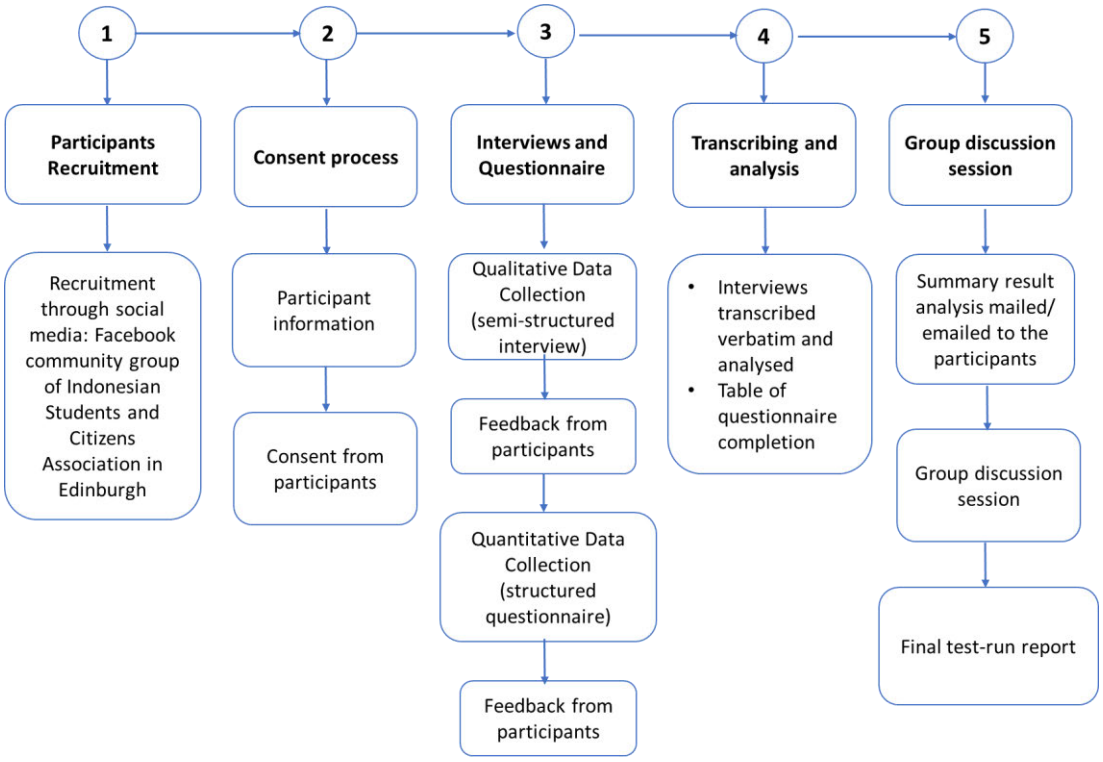

Figure 4.2 Pilot study data collection flow diagram

Social media were used to recruit a convenience sample of participants for this study through a Facebook® community group for the Indonesian Students and Citizens Association in Edinburgh. The members of this community group are Indonesian students, employees, and dependents currently living in

Edinburgh. The age range of this group member is between 20 and 50 years old. The researcher posted brief information about the pilot study in this community group, then group members who were willing to participate in this study contacted the researcher to get more information about the pilot study. The general information about the pilot study, which was posted in social media, is presented in Appendix 4.6. The information in Appendix 4.6 had been translated into Indonesian for group member convenience, which can be found in Appendix 4.7.

The second stage of this pilot study was to inform participants about the nature of the study, risks and benefits, and confidentiality. If participants agree to contribute to the study, then they could complete and sign the consent form. The information leaflet and consent form in English can be found in Appendix 4.8 and Appendix 4.9, respectively. The information leaflet and consent form in Indonesian are presented in Appendix 4.10 and Appendix 4.11, respectively. A copy of the consent form signed by both the participant and the researcher who conducted this study was given to the participant for his/her documentation.

After the consent had been obtained, the third stage was interview and questionnaire completion by the participants. Participants were asked to give feedback after each data collection. There were two feedback forms which should be completed by the participants, namely an interview feedback form and a questionnaire feedback form. The interview feedback form and a questionnaire feedback form in English are presented in appendix 4.12 and 4.13, while the Indonesian version of these forms can be found in appendix 4.14 and 4.15. The informed consent process, interviews, questionnaire, and feedback completion took place in Edinburgh Dental Institute (EDI).

These were the expected feedback from participants after they had done with their interviews and questionnaire completion (World Health Organization, 2016):

- Participants' understanding of the questions in interviews and questionnaire (clarity of the questions).
- Participants' opinions if there were any difficult words or phrases that they could not / did not understand.
- Participants' opinions if there were any words, phrases, or expressions which they might think offensive or unacceptable.
- Participants' suggestions regarding alternative words, phrases, or expressions that may be needed in this context.

After each participant had completed their interview, questionnaire and feedback, the interviews were transcribed and coded for the emergence themes prior to the group discussion.

The last stage was a group discussion session which was used to verify any modifications to the instruments based on the feedback from participants. In addition to this, the group discussion session was used to give an opportunity to the participants to discuss the overall themes findings from the interviews.

Each participant was sent a copy of the summary of the themes findings and the revised instruments by email one week before the group discussion session. The participants were asked to read the documents before the group discussion session. This step aimed to give participants plenty of time to consider the material at their convenience.

The researcher asked for the participants' reactions toward the summary of the themes findings at the group discussion session. Participants were encouraged to give their opinion, explanation, and suggestions freely at this

session. The discussion session format followed some points of respondent validation guidance developed by Doyle (Doyle, 2007):

- Discussion about the clarity of the instruments after some modifications which accommodate feedbacks from the participants
- Confirmation of the study' themes findings
- Discussion of overall themes derived from interviews
- Closure of the group discussion session and pilot study process

Participants' feedback in this session was used to clarify interpretations and refine explanations in this report. The group discussion session was held at the EDI.

4.3 Participants and sampling

The participants in this pilot study were Indonesian citizens currently living in Edinburgh. Most Indonesians currently living in Edinburgh are students, employees, dependents, and children. This pilot study recruited seven Indonesian men and women of age above 25-year-old as a convenience sample.

Purposeful sampling was used in this pilot to select participants based on their gender and age. Table 4.1 presents the criteria of purposeful sampling of this pilot study.

Table 4.1 Purposive sample criteria.

Criteria	Details
Gender	1. Male 2. Female
Age	1. 25-29 years old 2. 30 years old and above

4.4 Enrolment criteria

The following inclusion and exclusion criteria were applied to recruit participants for the pilot.

As the inclusion criteria, subjects were accepted as participants of the pilot if they could meet the following requirements:

- Participants were native Indonesian adults of age 20 years old and above currently living in Edinburgh
- Participants were able to participate in the interview, questionnaire completion, feedback forms completion, and group discussion session arranged at a time convenient for them.
- Participants were able to provide informed consent.

As the exclusion criteria, subjects were not accepted as participants of the pilot if:

- Subjects were unable to comply with instructions for the interview, questionnaire, feedback, and group discussion session.
- Indonesian was not subject's native language.

4.5 Data processing and analysis

The interviews from the first session of the pilot were recorded on a digital recorder. The audio recordings of interviews were transcribed verbatim and analysed. The interview was conducted in the Indonesian language.

In the pilot's interview transcriptions themes coding, researchers followed these three steps of coding: data familiarising, initial coding, and focused coding. As the first step, researchers read each transcription to get a feel for data (familiarising themselves with the data). The next step was exploring the potential codes segment by segment within the transcriptions data (initial coding). In this step, researchers tried to see actions and themes emerging in each segment of data. Focused coding was the next major step in the coding

process. This step requires decisions to select the most significant and frequent earlier codes in order to categorise the data.

The interviews were conducted in Indonesian with the PhD student as the interviewer. The transcriptions coding was done by two researchers who currently study at the Edinburgh Dental Institute. These two researchers independently coded the transcriptions to find emerging themes. The two researchers who did the coding for this test-run are native Indonesian. The first coder was the PhD student who conducted the pilot, and the second coder was Doctor of Clinical Dentistry (DClinDent) student from Oral Surgery Department. The first coder used software for qualitative data NVIVO 10 to do the coding process, while the second coder did the coding manually without qualitative software.

Two researchers who did the transcriptions coding were agreed to take some steps to address the challenges present in the translation of the final themes and sub-themes findings from Indonesian into English. Firstly, the two coders did the transcriptions coding and decided the themes and sub-themes identified from the transcriptions in the original language of interview transcriptions (Indonesian) to minimise the possibility of losing the original meaning of the data transcriptions from its natural setting. This step can be done as both coders are native Indonesian and have knowledge about linguistic and cultural affiliation to understand the contexts interviewees speaking without the need of an interpreter. After both coders had identified the themes and sub-themes findings from transcriptions, they discussed any discrepancies and similarities between them. At the end of the discussion, both coders agreed on the final themes and sub-themes identified from their work.
The next step, the first coder translated the themes and sub-themes agreed between both coders from Indonesian (the original language in the interview transcriptions) into English. Then, the first coder reported the themes and sub-themes translation to the second coder and discussed the final themes and sub-themes identified from the pilot study.

4.6 Pilot study modification and themes findings

4.6.1 Modification of the research instruments

A structured questionnaire and semi-structured topic guide as the research instruments on this study had been modified based on the feedback and suggestions from the participant in the first stage and second stage.

In the first stage, participants were asked to give feedback after each data collection (interview and questionnaire completion). All of the participants completed an interview feedback form and a questionnaire feedback form.

In the last stage, a group discussion session was used to verify any modifications to the instrument based on the feedback from the participants. Furthermore, the group discussion session was used to give an opportunity to the participants to discuss and give more opinions to the modified research instruments. Participants' suggestions have been used to improve the effectivity and appropriateness of the instruments. Overall, all of the participants gave a good response and appreciation to the pilot.

The details of questionnaire modification based on the feedback received from the participants are given in Appendix 4.16, while the details of the interview topic guide modification are presented in Appendix 4.17. These research instruments, which had been modified based on the participants' feedbacks, were used for the data collection in Depok, Indonesia.

4.6.2 Themes findings

There were seven participants participated in the first session, four female participants and three male participants. The interviews were last around 28-90 minutes. Table 4.2 presents the characteristics of the participants involved in the first stage of the study. Numbers were used as participants' identifier in this report to ensure confidentiality.

Table 4. 2 Gender and age group of the interviewees.

Study Number	Gender	Age group
1	Female	25-30
2	Female	46-50
3	Female	36-40
4	Male	41-45
5	Male	36-40
6	Female	31-35
7	Male	31-35

The themes agreements identified from seven participants' interview transcriptions are presented in appendix 4.18.

Emerging themes were divided into two key areas: data related to the experience of oral/dental problems and data related to individual and environmental factors which may affect oral disease experiences. These themes findings were not discussed in details for this pilot as the pilot was only focussed on the assessment of the research instruments' effectivity and appropriateness to be used for the data collection in Indonesia.

Chapter 5 Quantitative research: Oral health impact profile and periodontal status of the urban older population in Indonesia

Chapter 5 presents the quantitative research aim, objectives, and results. The research results reported include descriptive statistics of the characteristics of the sample and research findings regarding the relationship between periodontal disease experienced by the urban older population in Depok and their quality of life. The oral health-related quality of life was evaluated through the OHIP-14 assessment of the prevalence, severity, and extent of the impacts. The discussion, strengths and limitations of the study, and conclusion are also presented in this chapter.

5.1 Aim

The quantitative research part aims to investigate the relationship between oral health-related quality of life (OHRQoL) and periodontal diseases in the ageing population in Indonesia. Periodontal disease was evaluated subjectively through its impacts on participants' oral health-related quality of life.

The details of the objectives of the study are expressed below:

- To investigate the relationship between the prevalence of impact on quality of life and urban older people's periodontal health condition.
- To assess the relationship of the severity of impact on quality of life and urban older people's background information (oral health condition, demographic, socioeconomic, behavioural and systemic disease, and their subjective appraisal about their health).
- To examine the relationship of the extent of impact on quality of life and urban older people's background information (oral health condition,

demographic, socioeconomic, behavioural and systemic disease, and their subjective appraisal about their health).

- To compare the findings related to the relation between periodontal disease and quality of life (with a developing country as a research background) with those of previous studies in both developed and developing countries as backgrounds.

5.2 Results

The quantitative data collection was collected from 369 participants by three dental examiners, with each examiner seeing the different subject. From the 369 participants, six participants were excluded from the analysis because of edentulism.

5.2.1 Descriptive statistics

Characteristics of the sample of the urban older population are summarised in Table 5.1.

Table 5.1 Characteristics of the sample

Characteristics	Independent variables	Groups	n (%)
Demographic	Age	• 51-64 years • 65-years and above	• 149 (41) • 214 (59)
	Gender	• Male • Female	• 115 (31.7) • 248 (68.3)
	Marital status	• Single • Divorced/ Separated • Widower • Married	• 4 (1.1) • 2 (0.6) • 159 (43.8) • 198 (54.5)

Table 5.1 continued (1)

Characteristics	Independent variables	Groups	n (%)
Socioeconomic	Educational background	• Never attended formal school	• 29 (8)
		• Not completed elementary school	• 86 (23.7)
		• Elementary school	• 93 (25.6)
		• Junior high school	• 52 (14.3)
		• High school/vocational school	• 79 (21.8)
		• College/University	• 24 (6.6)
	Family income	• Under the minimum wage (Up to Rp. 3.500.000)	• 241 (66.4)
		• More than minimum wage	• 117 (32.2)
		• Missing data	• 5 (1.4)
			•
Behavioural	Smoking status	• Never smoker	• 275 (75.8)
		• Former smoker	• 52 (14.3)
		• Current smoker	• 36 (9.9)
	Brushing habits	• Brushing at least two times a day	• 344 (94.8)
		• Brushing less than two times a day	• 19 (5.2)
	Pattern of dental visit	• Routine dental check-ups at least once a year	• 26 (7.2)
		• Not having a routine dental check-ups	• 337 (92.8)
Systemic disease	Diabetes status	• No Diabetes	• 321 (88.4)
		• Diabetes	• 42 (11.6)
	Diabetes time duration	• No diabetes	• 321 (88.4)
		• 10 years and below	• 28 (7.7)
		• More than 10 years	• 14 (3.9)
Oral health condition	DMF-T score	• Very low - Low	• 36 (9.9)
		• Moderate – High	• 327 (90.1)
	OHI-S	• Good	• 21 (5.8)
		• Fair	• 135 (37.2)
		• Poor	• 207 (57)

Table 5.1 continued (2)

Characteristics	Independent variables	Groups	n (%)
Oral health condition	Furcation status	• Not having teeth with furcation involvement	• 205 (56.5)
		• Having teeth with furcation involvement	• 158 (43.5)
	Mobility status	• Physiological mobility	• 134 (36.9)
		• Having teeth with increased mobility	• 229 (63.1)
	Periodontal status	• Not having chronic generalised periodontitis	• 91 (25.1)
		• Having chronic generalised periodontitis	• 272 (74.9)
Subjective appraisal	Subjective appraisal of dental health	• Very good and good	• 187 (51.5)
		• Fair	• 160 (44.1)
		• Bad and very bad	• 16 (4.4)

There are some notes for the categorisation of the independent variables above, which are the marital status and income categories variables. The marital status was merged into two categories, 'single, divorced/separated, and widower' group and 'married' group for the analysis purpose. The rational to merged categories of the marital status variable was based on the consideration that those in single, divorced/separated, and widower groups might potentially live independently by themselves without a partner, and those in the married group have a partner. In addition to this, the data regarding those with single and divorced/separated status were in small number, those we decided to merge the categories into one category with the widower category. However, we acknowledge that this approach to merge the marital status into two categories ('single, divorced/separated, and widower' category and 'married' category) is not a common practice of the marital status categorisation.

The cut off used to categorise the family income was the standardised minimum wage in 2017 recommended by the government. The descriptive statistics for the family income categories should be taken carefully as many of the participants were not comfortable to disclose their family income. Moreover, some of them might only report the income from one person in the family who acted as head of the family or main breadwinner in the family and did not report other supporting income obtained by the family.

Data on the prevalence, severity, and extent of the impacts by OHIP-14 dimensions and the total OHIP-14 score are presented in Table 5.2. More than seventy-three per cent of the older people reported one or more OHIP items as 'fairly often' or 'very often' (prevalence of the impact). The severity score mean, which refer to the mean of the sum of the Likert-type responses of the fourteen OHIP questions, was 11.86 The extent of impacts mean, which refer to the mean number of OHIP items reported as 'fairly often' or 'very often, was 1.91. Psychological discomfort, functional limitation, physical pain, and physical disability dimensions of the OHIP accounted for the highest prevalence, severity, and extent of impacts, respectively.

Table 5.2 Prevalence, extent, and severity of impacts by OHIP-14 dimensions and the OHIP-14 total score (N = 363).

Dimension	***Prevalence:*** Number of individuals who reported one or more impacts fairly often or very often (%)	***Severity:*** Mean OHIP-14 score (SD)	***Extent:*** Mean number of OHIP-14 items reported fairly or very often (SD)
• Functional limitation	135 (37.2)	2.66 (2.04)	0.44 (0.62)
• Physical pain	104 (28.7)	2.52 (1.81)	0.32 (0.54)
• Psychological discomfort	208 (57.3)	3.03 (1.81)	0.66 (0.63)
• Physical disability	96 (26.4)	1.70 (1.74)	0.29 (0.51)
• Psychological disability	24 (6.6)	0.88 (1.53)	0.08 (0.33)
• Social disability	13 (3.6)	0.48 (1.17)	0.05 (0.26)
• Handicap	27 (7.4)	0.59 (1.09)	0.07 (0.26)
Total OHIP-14	**267 (73.6)**	**11.86 (7.25)**	**1.91 (1.91)**

5.2.2 Periodontal disease and prevalence of the impact

The risk of having an impact on the quality of life based on the prevalence of the impact was not significantly associated with periodontal disease status (χ^2 = 0.09 (*df* = 1, n = 363), *p* = 0.77), and furcation status (χ^2 = 1.93 (*df* = 1, n = 363), *p* = 0.17). However, teeth mobility status as one of the periodontal disease manifestations was significantly associated with the prevalence of impact (χ^2 = 6.784 (*df* = 1, n = 363), *p* = 0.009). Based on the odds ratio, older people who have teeth with increased mobility were more likely to experience impact on their quality of life, with the odds ratio being almost two times than older people who do not have any teeth with increased mobility (OR: 1.871, 95% CI: 1.164 - 3.009). Table 5.3 elucidates the association of the periodontal condition with the prevalence of impact. This result is explained further by several domains of the OHIP, which were significantly associated with subjects' teeth mobility status (Table. 5.4). Those domains of the OHIP affected by the teeth mobility status were functional limitations (*p* = 0.027), physical pain (*p* = 0.012), psychological discomfort (*p* = 0.031), physical disability (*p* = 0.037), and handicap (*p* = 0.04). On the other hand, psychological disability and social disability domains were not significantly associated with subjects' teeth mobility status.

Table 5.3 Percentage and odds ratios of the prevalence of impact according to the periodontal condition.

Periodontal condition	Prevalence of impact (fairly/very often)			
	***n* (%)**	**Odds ratio (95% CI)**	**χ^2 *statistic***	***p-value***
Periodontal status				
• Not having chronic generalised periodontitis	68 (74.7)	0.92 (0.54 – 1.59)	0.09	0.77
• Having chronic generalised periodontitis	199 (73.2)			
Furcation status				
• Not having teeth with furcation involvement	145 (70.7)	1.4 (0.87 – 2.26)	1.93	0.17
• Having teeth with furcation involvement.	122 (77.2)			
Teeth mobility status				
• Physiological mobility	88 (65.7)	1.87 (1.16 – 3.01)	6.78	0.009
• Having teeth with increased mobility	179 (78.2)			

Table 5.4 Percentage and odds ratios of the prevalence of impact of the seven OHIP dimensions according to teeth mobility status.

OHIP dimension	Prevalence of impact (fairly/very often)			
	***n* (%)**	**Odds ratio (95% CI)**	**χ^2 *statistic***	***p-value***
Functional limitation				
Teeth mobility status				
• Physiological mobility	40 (29.9)	1.67	4.90	0.027
• Having teeth with increased mobility	95 (41.5)	(1.06 – 2.62)		
Physical pain				
Teeth mobility status				
• Physiological mobility	28 (20.9)	1.88	6.25	0.012
• Having teeth with increased mobility	76 (33.2)	(1.14 – 3.10)		
Psychological discomfort				
Teeth mobility status				
• Physiological mobility	67 (50.0)	1.60	4.63	0.031
• Having teeth with increased mobility	141 (61.6)	(1.04 – 2.47)		
Physical disability				
Teeth mobility status				
• Physiological mobility	27 (20.1)	1.71	4.33	0.037
• Having teeth with increased mobility	69 (30.1)	(1.03 – 2.84)		
Psychological disability				
Teeth mobility status				
• Physiological mobility	6 (4.5)	1.82	1.57	0.211
• Having teeth with increased mobility	18 (7.9)	(0.70 – 4.70)		
Social disability				
Teeth mobility status				
• Physiological mobility	3 (2.2)	1.99	NA*	0.387
• Having teeth with increased mobility	10 (4.4)	(0.54 – 7.38)		

Table 5.4 continued.

OHIP dimension	Prevalence of impact (fairly/very often)			
	***n* (%)**	**Odds ratio (95% CI)**	**χ^2 *statistic***	***p-value***
Handicap Teeth mobility status • Physiological mobility • Having teeth with increased mobility	5 (3.7) 22 (9.6)	2.74 (1.01 – 7.42)	4.24	0.04

Pearson Chi-square p-value was reported if cells have expected frequencies of 5 or more. Fisher's exact probability test value was reported if cells have expected frequencies of less than 5. *NA: not applicable.

5.2.3 The severity of the impact

The severity of the effect was measured by the total OHIP score (sum of the Likert-type responses for the fourteen OHIP questions). The range of the overall scores may vary from 0 to 56.

Table 5.5 until Table 5.10 presents an analysis of the severity of the impact according to several predictor factors derived from independent t-test and analysis of variance test. The tables 5.5 until 5.10 reported a mean difference to give information about whether the mean difference has reached a clinically significant difference of the total OHIP score. The minimal important difference (MID) for the OHIP-14 is described as 5-scale points (Locker et al., 2004a).

Table 5.5 Severity of the impact according to the demographic predictor (age group, gender, and marital status).

Independent variables	n	Mean	Mean Difference	95% CI of the difference	*p-value*
Age groups					
• 50-64 years	149	11.54	-0.54	-2.06 – 0.98	0.485[a]
• 65-years and above	214	12.08			
Gender					
• Male	115	11.5	-0.54	-2.15 – 1.07	0.513[a]
• Female	248	12.03			
Marital status					
• Single, divorced and widower	165	11.35	-0.94	-2.44 – 0.57	0.221[a]
• Married	198	12.29			

[a] **Independent t-test**

Table 5.6 Severity of the impact according to the socioeconomic predictor (family income and educational background).

Independent variables	n	Mean	Mean Difference	95% CI of the difference	*p-value*
Family income					
• Under the minimum wage (Up to Rp. 3.500.000)	241	12.01	0.68	-0.93 – 2.29	0.408[a]
• More than minimum wage	117	11.33			

[a] **Independent t-test**

Table 5.6 continued.

Independent variables	n	Mean	Mean Difference	Median (Min-Max value)	*p-value*
Educational background					
• Never attended formal school*[1]	29	10.79	The range of mean difference: 0.07 – 1.43	12 (0 – 21)	0.91[b]
• Not completed elementary school*[2]	86	12.22		11 (0 – 36)	
• Elementary school*[3]	93	11.82		11 (0 – 39)	
• Junior high school*[4]	52	12.13		12 (2 – 31)	
• High school/vocational school*[5]	79	12.06		11 (0 – 31)	
• College/University*[6]	24	10.79		10 (0 – 34)	

[b] **Kruskal-Wallis test.**

Table 5.7 Severity of the impact according to the behavioural predictor (smoking status, brushing habits, and pattern of dental visit).

Independent variables	n	Mean	Mean Difference	95% CI of the difference	*p-value*
Smoking status					
• Never smoke*[1]	275	11.73	• group 1 and 2: -0.55	• group 1 and 2: -3.14 – 2.03	0.839[c]
• Former smoker*[2]	52	12.29	• group 1 and 3: -0.49	• group 1 and 3: -3.52 – 2.54	
• Active smoker*[3]	36	12.22	• group 2 and 3: 0.07	• group 2 and 3: -3.64 – 3.77	
Brushing habits					
• Brushing at least two times a day	344	11.67	-3.64	-6.99 – 0.3	0.033[a]
• Brushing less than two times a day	19	15.32			

[a] **Independent t-test;** [c] **One-way ANOVA.**

Table 5.7 continued

Independent variables	n	Mean	Mean Difference	95% CI of the difference	*p-value*
Pattern of dental visit • Routine dental check-ups at least once a year • Not having a routine dental check-ups	26 337	9.88 12.01	-2.13	-5.03 – 0.77	0.149[a]

[a] **Independent t-test;** [c] **One-way ANOVA.**

Table 5.8 Severity of the impact according to the systemic disease predictor (diabetes status and diabetes time duration).

Independent variables	n	Mean	Mean Difference	95% CI of the difference	*p-value*
Diabetes status • No Diabetes • Diabetes	321 42	11.71 13.02	-1.31	-3.65 – 1.03	0.27[a]
Independent variables	**n**	**Mean**	**Mean Difference**	**Median (Min-Max value)**	***p-value***
Diabetes time duration • No diabetes*[1] • 10 years and below*[2] • More than 10 years*[3]	321 28 14	11.71 12.96 13.14	• group 1 and 2: -1.25 • group 1 and 3: -1.43 • group 2 and 3: -0.18	11 (0 – 39) 11 (2 – 36) 12 (2 -34)	0.682[b]

[a] **Independent t-test;** [b] **Kruskal-Wallis test.**

Table 5.9 Severity of the impact according to the oral health condition predictor (DMF-T, OHI-S, furcation status, mobility status, and periodontal status).

Independent variables	n	Mean	Mean Difference	95% CI of the difference	*p-value*
DMF-T score					
• Very low - Low	36	7.28	-5.09	-6.94 – -3.24	<0.001[a]
• Moderate – High	327	12.37			
Furcation status					
• Not having teeth with furcation involvement	205	11.22	-1.48	-2.98 – 0.03	0.054[a]
• Having teeth with furcation involvement	158	12.7			
Mobility status					
• Physiological mobility	134	9.99	-2.98	-4.5 – -1.45	<0.001[a]
• Having teeth with increased mobility	229	12.96			
Periodontal status					
• Not having chronic generalised periodontitis	91	11.91	0.07	-1.66 – 1.8	0.94[a]
• Having chronic generalised periodontitis	272	11.85			
Independent variables	**n**	**Mean**	**Mean Difference**	**Median (Min-Max value)**	***p-value***
OHI-S					
• Good*[1]	21	11	• group 1 and 2: -1.47	10 (3 – 24)	0.444[b]
• Fair*[2]	135	12.47	• group 1 and 3: -0.55	12 (0 – 32)	
• Poor*[3]	207	11.55	• group 2 and 3: 0.92	11 (0 – 39)	

[a] Independent t-test; [b] Kruskal-Wallis test.

Table 5.10 Severity of the impact according to the subjective appraisal of dental health condition.

Independent variables	n	Mean	Mean Difference	Median (Min-Max value)	*p-value*
Subjective appraisal of dental health					
Very good and good*[1]	187	10.04	• group 1 and 2: -3.54	9 (0 – 36)	< 0.001[b]
Fair*[2]	160	13.58	• group 1 and 3: -5.96	12 (0 – 34)	
Bad and very bad*[3]	16	16	• group 2 and 3: -2.42	15 (3 – 39)	

[b] **Kruskal-Wallis test.**

The total OHIP score differs significantly according to the brushing habits, DMF-T score, teeth mobility status, and subjective appraisal of dental health. The overall OHIP score does not vary significantly according to age group, gender, marital status, educational background, family income, smoking status, diabetes status and diabetes time duration, a pattern of the dental visit, OHI-S, furcation status, and periodontal status.

Urban older people who brushed their teeth at least two times a day had a mean total OHIP score 3.64 (95% CI: -6.99 – 0.3) lower than those who brushed their teeth less than two times a day, $p = 0.033$.

Urban older people with very low or low DMF-T score have a mean total OHIP score 5.09 (95% CI: -6.94 – -3.24) lower than those with moderate or high DMF-T score, $p =$ **< 0.001.** In addition to this, urban older people who did not have any teeth with increased mobility (the physiological mobility group) had a mean total OHIP score 2.98 (95% CI: -4.5 – -1.45) lower than those who had teeth with increased mobility, $p = < 0.001$.

The severity of impact is significantly related to urban older people's subjective appraisal toward their dental health condition, χ^2 (*df*: 2, N = 363) = 31.01, $p = <$ 0.001. Urban older people who subjectively appraise that they had bad or very

bad dental condition recorded the highest mean rank (*Mean rank:* 221.44*)*. Urban older people who appraise that they had a fair dental condition recorded lower *mean rank* than those who appraise their dental condition as bad or very bad (*Mean rank:* 212.73). The smallest mean rank was recorded by those who appraised their dental condition as very good or good (*Mean rank* = 152.33).

Pairwise comparison between groups with Bonferroni correction for multiple tests showed a statistically significant difference between "Very good and good" group and "Fair" group (p = < 0.001**,** with a small to medium effect size (r = -0.29)) and also between the group of "Very good and good" and "Bad and very bad" (p = 0.034), with a small to medium effect size (r = -0.18)). However, there was no significant difference between "Fair" group and "Bad and very bad group" (p = 1), with a small effect size (r = -0.02)).

A Jonckheere-Terpstra test for ordered alternatives showed that there was a statistically significant trend of higher severity of impact score with worse levels of subjective appraisal of dental condition, T_{JT} = 23374.5, z = 5.55, p = < 0.001, with a small to medium effect size (r = 0.29).

Although brushing habits, subjective appraisal of the dental health, DMF-T score, and teeth mobility status have met statistically significant test, only DMF-T score (mean difference between "very low-low" group and "moderate-high" group = 5.09) and subjective appraisal of dental condition variables (mean difference between "very good and good" group and "bad and very bad group = 5.96) which have a clinical important difference. The other variables which have statistically significant results have a mean difference less than 5-scale points: brushing habits (mean difference = 3.64) and teeth mobility status (mean difference = 2.98).

5.2.4 The extent of the impact

The extent of impact refers to the number of OHIP items experienced 'fairly often' or 'very often'. There are 14 items in the OHIP questionnaire. The range of the extent of the impact may vary from 0 to 14. The extent of impact score

indicates more daily life performances affected. Table 5.11 up to table 5.16 present an analysis of the extent of impact according to several predictor factors derived from the *Mann-Whitney U* test and *Kruskal Wallis* test.

Table 5.11 Extent of impact according to the demographic predictor (age group, gender, and marital status).

Independent variable	n	Median (Min-Max value)	*p-value*	Effect size *(r)*
Age groups				
• 50-64 years	149	1 (0 – 11)	0.206[a]	0.07
• 65-years and above	214	2 (0-10)		
Gender				
• Male	115	2 (0-7)	0.508[a]	-0.03
• Female	248	1 (0-11)		
Marital status				
• Single, divorced and widower	165	1 (0-10)	0.733[a]	0.02
• Married	198	2 (0-11)		

[a] Mann-Whitney U test

Table 5.12 Extent of impact according to the socioeconomic predictor (educational background and family income).

Independent variable	n	Median (Min-Max value)	*p-value*	Effect size *(r)*
Educational background				
• Never attended formal school*[1]	29	2 (0-5)	0.105[b]	0.48
• Not completed elementary school*[2]	86	2 (0-10)		
• Elementary school*[3]	93	1 (0-11)		
• Junior high school*[4]	52	1 (0-7)		
• High school/vocational school*[5]	79	2 (0-6)		
• College/University*[6]	24	1 (0-8)		
Family income				
• Under the minimum wage (Up to Rp. 3.500.000)	241	2 (0-11)	0.024[a]	-0.12
• More than minimum wage	117	1 (0-8)		

[a] Mann-Whitney U test; [b] Kruskal Wallis.

Table 5.13 Extent of impact according to the behavioural predictor (smoking status, brushing habits, and pattern of dental visit).

Independent variable	n	Median (Min-Max value)	*p-value*	Effect size *(r)*
Smoking status				
Never smoke*[1]	275	1 (0-11)	0.249[b]	0.15
Former smoker*[2]	52	2 (0-7)		
Active smoker*[3]	36	2 (0-6)		
Brushing habits				
Brushing at least two times a day	344	1 (0 – 11)	0.008[a]	0.14
Brushing less than two times a day	19	2 (0 – 8)		
Pattern of dental visit				
Routine dental check-ups at least once a year	26	1 (0 – 5)	0.046[a]	0.10
Not having a routine dental check-ups	337	1 (0 – 11)		

[a] Mann-Whitney U test; [b] Kruskal Wallis.

Table 5.14 Extent of impact according to the systemic disease predictor (diabetes status and diabetes time duration).

Independent variable	n	Median (Min-Max value)	*p-value*	Effect size *(r)*
Diabetes status				
No Diabetes	321	1 (0-11)	0.15[a]	0.08
Diabetes	42	2 (0-10)		
Diabetes time duration				
No diabetes	321	1 (0-11)	0.26[b]	0.14
10 years and below	28	2 (0-10)		
More than 10 years	14	2 (0-8)		

[a] Mann-Whitney U test; [b] Kruskal Wallis.

Table 5.15 Extent of impact according to the oral health condition predictor (DMF-T, OHI-S, furcation status, mobility status, and periodontal status).

Independent variable	n	Median (Min-Max value)	*p-value*	Effect size *(r)*
DMF-T score				
Very low - Low	36	1 (0 – 4)	0.001[a]	0.17
Moderate – High	327	2 (0 – 11)		
OHI-S				
Good	21	1 (0 – 7)	0.97[b]	0.003
Fair	135	2 (0 – 8)		
Poor	207	1 (0 – 11)		
Furcation status				
Not having teeth with furcation involvement	205	1 (0 – 8)	0.026[a]	0.12
Having teeth with furcation involvement	158	2 (0 – 11)		
Mobility status				
Physiological mobility	134	1 (0 – 7)	0.001[a]	0.17
Having teeth with increased mobility	229	2 (0 – 11)		
Periodontal status				
Not having chronic generalised periodontitis	91	1 (0 – 7)	0.996[a]	-0.0003
Having chronic generalised periodontitis	272	1 (0 – 11)		

[a] Mann-Whitney U test; [b] Kruskal Wallis.

Table 5. 16 Extent of impact according to the subjective appraisal of dental health condition.

Independent variable	n	Median (Min-Max value)	*p-value*	Effect size *(r)*
Subjective appraisal of dental health				
Very good and good*[1]	187	1 (0 – 10)	< 0.001[b]	1.27
Fair*[2]	160	2 (0 – 8)		
Bad and very bad*[3]	16	3 (0 – 11		

[b] Kruskal Wallis.

The extent of impact differs significantly according to family income, brushing habits, the pattern of the dental visit, subjective appraisal of dental health, DMF-T score, furcation involvement status, and mobility status. The extent of impact does not differ significantly according to age group, gender, marital status, educational background, smoking status, diabetes status, diabetes time duration, OHI-S, and periodontal status.

The extent of impact in urban older people who have income under the minimum wage (*Mean rank*: 187.89) differs significantly from urban older people who have income more than minimum wage (*Mean rank*: 162.21), p = 0.024, with a small to medium effect size (r = 0.12).

Brushing habits and pattern of the dental visit are behavioural predictors, which give evidence of a significant difference in the extent of the impact. Urban older people who brushed their teeth less than two times a day have a higher mean rank (*Mean rank*: 242.68) than those who brushed their teeth at least two times a day (*Mean rank*: 178.65), p = 0.008, with a small to medium effect size **(***r* = 0.14). Urban older people who have routine dental check-ups at least once a year have a lower mean rank (*Mean rank*: 143.23) from those who do not have any regular dental check-ups (*Mean rank:* 184.99*), p* = 0.046, with a small to medium effect size **(***r* = 0.11).

The extent of impact score differs significantly between some of the oral health condition predictors: DMF-T, furcation involvement status, and mobility status. Urban older people who have very low or low DMF-T score have a lower mean rank (*Mean rank*: 129.31) than those who have moderate or high DMF-T score (*Mean rank*: 187.80), p = 0.001, with a small to medium effect size (r = 0.17). Urban older people who have teeth with furcation involvement have a higher mean rank (*Mean rank*: 195.65) and those who do not have any teeth with furcation involvement (*Mean rank*: 171.48), p = 0.026, with a small to medium effect size **(***r* = 0.12). Urban older people who have teeth with increased mobility have a higher mean rank (*Mean rank:* 195.37) and those who do not have any teeth with increased mobility (159.15), p = 0.001**,** with a small to medium effect size **(***r* = 0.17).

The extent of impact is significantly related to urban older people's subjective appraisal toward their dental health condition, χ^2 (*df:* 2, N = 363) = 24.173, *p* = < 0.001. Urban older people who subjectively appraise that they have bad or very bad dental condition recorded the highest mean rank (*Mean rank:* 244.31*)*. Urban older people who appraise that they have a fair dental condition recorded lower *mean rank* than those who appraise their dental condition as bad or very bad (*Mean rank:* 204.41). The smallest mean rank was recorded by those who appraise their dental condition as very good or good (*Mean rank* = 157.50).

Pairwise comparison between groups with Bonferroni correction for multiple tests showed a statistically significant difference between "Very good and good" group and "Fair" group (*p* = < 0.001, with a small to medium effect size (*r* = -0.23)) and also between the group of "Very good and good" and "Bad and very bad" (*p* = 0.004, with a small to medium effect size (*r* = -0.23)). However, there was no significant difference between "Fair" group and "Bad and very bad group" (*p* = 0.415, with a small to medium effect size (*r* = -0.11)).

A Jonckheere-Terpstra test for ordered alternatives showed that there was a statistically significant trend of higher extent of impact score with worse levels of subjective appraisal of dental condition (from "very good and good", "fair", to "bad and very bad"), T_{JT} = 22,641, *z* = 4.926, *p* = < 0.001, with a small to medium effect size (r = 0.26).

5.3 Discussion

Psychological discomfort (57.3 %), functional limitation, (37.2 %), physical pain (28.7 %), and physical disability (26.4 %) were the dimensions of the OHIP which had the highest prevalence of the impact in this study population. On the other hand, other domains of the OHIP (psychological disability, social disability, and handicap) were accounted for less than 8 % of the prevalence of the impact. These findings confirm the results from previous studies. A national survey of the Canadian adult population underlined psychological

discomfort (11.3%) and physical pain (9.3 %) as the dimensions of the OHIP which had the most impact on the quality of life (Locker and Quiñonez, 2009). A cross-sectional study of 20-64 years old population conducted in Brazil found psychological discomfort (35.8 %) and physical pain (19.6 %) as the most reported impacts of the OHIP dimensions (Batista et al., 2014a). In addition to this, a birth cohort study of 32 years conducted in New Zealand accounted physical disability (10.7 %) and psychological disability (10.3%) as the most reported OHIP dimensions (Lawrence et al., 2008). Interestingly, our findings of the most reported impacts of OHIP's dimensions are considerably high in comparison with the previous studies above. Another difference from the earlier studies is our results marked functional limitation as one of the dimensions with a high prevalence of impact reported by the urban older people. This added finding from the previous studies might be due to different study population's age ranges. This study focuses on older people with the age of 50 years and above where oral health problems and discomfort might be more prevalent, including a higher number of missing teeth. Furthermore, a higher number of missing teeth may cause more problem related to their normal oral functions experienced by this group of older people.

Periodontal disease status of the urban older people with generalised periodontitis was not associated with the risk of having more impacts on the quality of life. This result was based on the appraisal of the prevalence, severity, and extent of the impacts of the OHIP-14. This finding is comparable with several previous studies which mentioned that there were no established association between periodontal disease status and having an impact on the quality of life. The comparable studies were conducted in the adult population of Sweden, India, Nigeria, Sudan, Spain, and Australia as research backgrounds. However, there were previous studies which found an association between periodontal status and having more impacts on the quality of life. These studies were conducted in the adult population in Sweden, Brazil, German, and United Kingdom as research background. All of these comparable and contradictory previous studies had an adult population as their participants, utilised OHIP-14 as a subjective OHRQoL instrument, and pocket

depth assessment as criteria of the periodontal condition categories. Furthermore, previous studies with a focus on particular participants' condition, such as pregnant women, HIV/AIDS, and haemodialysis patient were excluded in the comparison.

The details of both comparable and contradictory previous studies' results from this study can be found in table 5.17 and 5.18, respectively.

Table 5.17 Previous studies with comparable results to this present study.

Comparable results from previous studies with this PhD study		
Authors (year)	**Population Characteristics**	**Findings related to prevalence, severity, and extent of the OHIP's impact.**
Kato et al. (2018)	• 804 participants aged ≥70 derived from two cohort studies of people living in Gothenburg, Sweden. • Aged 70 years and above.	• There was no statistical significance of the association between periodontal disease and poor oral health-related quality of life based on the severity and prevalence of the impacts assessments. Periodontal disease was categorised into three groups based on the periodontal pocket probing depth; no teeth with periodontal pocket, localised periodontitis, and generalised periodontitis (Kato et al., 2018).
Sanadhya et al .(2015)	• Rural (n = 600) and urban (n = 600) population in Udaipur, India. • Age ranges between 20 and 79 years.	• There was no significant association between periodontal health and quality of life assessed by the severity of the impact. Periodontal status was categorised into individuals with a healthy periodontal condition and those with the periodontal disease based on the Community Periodontal Index (CPI) assessment (Sanadhya et al., 2015).

Table 5.17 continued.

Comparable results from previous studies with this PhD study		
Authors (year)	**Population Characteristics**	**Findings related to prevalence, severity, and extent of the OHIP's impact.**
Lawal et al. (2014)	• 204 adult dental patient in Ibadan, Nigeria. • 18 years old and above.	• There was no statistically significant relationship between periodontal health and the prevalence of the impact. Individuals were categorised into two groups based on the CPI assessment, no periodontal pocket group and with periodontal pockets group (Lawal et al., 2014).
Khalifa et al. (2013)	• 1888 dental patients recruited from seven provinces of Khartoum State, Sudan. • Adults age 16 years old and above.	• There was no significant association between periodontal health and quality of life appraised by both severity and extent of the impacts. Individuals were classified into two groups based on the CPI assessment, no periodontal pocket group and with periodontal pockets group (Khalifa et al., 2013).
Montero-Martin et al (2009)	• A sample of 270 people of the regional government staff visiting the prevention centre in Granada (Spain) for medical check-up. • Adults (no specified information about the age ranges).	• There was no significant association between normative needs for periodontal treatment and both the severity and extent of the impacts. The periodontal condition was measured based on the CPI (Montero-Martin et al., 2009).
Marino et al (2008)	• 603 older migrant adults living independently in Melbourne, Australia. • Aged 55 years and older.	• There was no significant association between periodontal pocket (assessed by the CPI measurement) and the severity of the impact (Mariño et al., 2008).

Table 5.18 Previous studies with contradictory results to this present study.

Contradictory results from previous studies with this PhD study.		
Authors (year)	**Population Characteristics**	**Findings related to prevalence, severity, and extent of the OHIP's impact.**
Jansson et al. (2014)	• 443 participants lived in Skane, Sweden. • Age ranges 20 – 89 years.	• Periodontal disease significantly associated with higher severity of impact score. Periodontal condition was examined by probing pocket depth, bleeding on probing status, and radiographic examination (Jansson et al., 2014).
Palma et al. (2013)	• 150 patients treated in periodontics section of dental speciality centre in Brazil (38 patients were diagnosed with gingivitis and 112 patients were diagnosed with periodontitis). • Adults age 18 years and above.	• Total OHIP-14 score (severity of impact) was significantly higher among individuals with periodontitis than those with gingivitis. Periodontal status was obtained from clinical probing examination and standardised dental records (Palma et al., 2013).
Brauchle (2013)	• 93 patients from practice in German. • Age ranges 27-74.	• Periodontal disease has significantly affected the quality of life based on the OHIP's severity of impact assessment. Periodontal condition of patients was measured by probing pocket depth, CPI score (Brauchle et al., 2013).
White et al. (2012)	• British Adult Dental Health Survey 2009 conducted in England, Wales, and Northern Ireland. • 16 years and above.	• Individuals with severe periodontitis (pocket depth ≥ 6 mm or attachment loss ≥ 9 mm) reported more impacts on the quality of life (OHIP's severity and prevalence of the impact (White et al., 2012).

Table 5.18 continued.

Contradictory results from previous studies with this PhD study.		
Authors (year)	**Population Characteristics**	**Findings related to prevalence, severity, and extent of the OHIP's impact.**
Bernabe and Marcenes (2010)	• 3122 dentate adults who participated in the 1998 Adult Dental Health Survey in the United Kingdom. • 16 years and above.	• Periodontal disease was associated with quality of life (OHIP's severity of the impact). Individuals with periodontitis defined as at least one teeth with pocket depth ≥ 4mm and at least two teeth with loss attachment ≥ 4mm (Bernabe and Marcenes, 2010).
Jowett (2009)	• 36 patients at Charles Clifford Dental Hospital, Sheffield, UK. • 20 years and above.	• Patients with periodontal disease (Basic Periodontal Examination (BPE) code 3 or 4) reported more impacts on their quality of life than patients with a healthy periodontal condition (BPE code 0-2). The impact reported measured by the OHIP's extent of impact (Jowett et al., 2009).

This PhD study and a number of previous studies have reported a discrepancy between the periodontal clinical findings and perceived subjective assessments of oral health-related quality of life. On the other hand, some previous studies have confirmed an association between the periodontal disease and oral health-related quality of life. The differences between the studies' results might be explained by diverges in subjective perceptions, expectations, preferences, individuals' financial strength, social, and psychological state and support (Tsakos et al., 2006). The different research backgrounds may also be expected to affect those considerations. This recent study used urban older Indonesians society as a research background. Indonesia is one of the developing economies countries. Three of the comparable previous studies have a background of developing economies countries (India, Nigeria, and Sudan) and three from developed economies countries, Sweden, Spain and Australia. On the other hand, most of the

previous contradictory studies have a background of developed countries (Sweden, German, and United Kingdom), except Brazil.

Another consideration is the periodontal disease categorisation used in this study. Almost all of the participants in the study presented teeth affected by periodontitis; 97 per cent of the participants had one or more teeth with probing pocket depth 3.5 mm or more. The high prevalence of chronic periodontitis was predicted in the older people population as this disease increases in prevalence and severity with age (Newman et al., 2012). Thus, we decided to divide the periodontal condition into two groups for the analysis purpose: not having chronic generalised periodontitis and having chronic generalised periodontitis. Nevertheless, we should underline the possibility that some of the participants might have missing teeth due to generalised periodontitis in the past. However, their remaining teeth with periodontal pockets on the data collection day showed less than 30 per cent teeth affected by periodontitis due to tooth loss. Missing teeth as a confounding factor might mask an association or even gave false result regarding the relationship between periodontal disease and quality of life. Furthermore, a present systematic review also found evidence that the prevalence of generalised periodontal disease tends to diminish in the older adults group due to missing teeth among these older people (Ferreira et al., 2017a). In addition to this, Slade and Sanders's study also underlined that tooth loss and symptoms of the oral disease affected people's subjective appraisal toward oral health more significantly when they occur in adulthood than when they occur in old age (Slade and Sanders, 2011).

Although our findings did not find any significant association between periodontal disease status and quality of life, we found a significant relationship between teeth mobility status and quality of life. Increased tooth mobility is one of the clinical signs, which often appears in an advanced stage of chronic periodontitis with extensive attachment and bone loss (Newman et al., 2012). All of the assessments of the OHIP based on the prevalence (p = 0.009), severity (p = < 0.001), and extent of impact (p = 0.001) confirm the correlation between tooth mobility and quality of life. Despite the significant difference in

the severity of the impact on the quality of life and tooth mobility status, the mean difference between teeth mobility status did not reach the clinically important difference. The mean difference between the teeth mobility groups was less than five scale points. Nevertheless, there was strong evidence of the relationship showed by the prevalence and extent of the impacts assessments. Urban older people with increased teeth mobility were almost two times more likely to experience a negative impact on their quality of life compare to those who did not have teeth with increased mobility. Furthermore, the prevalence of the impact on quality of life was significantly associated with tooth mobility status of the older people in five OHIP's domains: functional limitation, physical pain, psychological discomfort, physical disability, and handicap.

The discrepancy of the association between periodontal disease status and teeth mobility status toward quality of life may be understood by the nature of periodontal disease as a chronic disease. This chronic disease may not show significant symptoms until it progresses to a later stage and create obvious symptoms (Cunha-Cruz et al., 2007, Petersen and Ogawa, 2012). Increased tooth mobility often appears in the advanced stage of chronic periodontitis (Newman et al., 2012). Moreover, tooth mobility may raise some noticeable problems affecting the quality of life, such as discomfort, pain, and eating difficulties. Borges et al. found a correlation between quality of life and tooth mobility. The study reported increased tooth mobility affected several of OHIP's dimensions negatively: physical pain, psychological discomfort, and physical disability (Borges et al., 2013). In addition to this, Montero-Martin reported periodontal probing depth status was not correlated with quality of life. The study explained that it might be because only some of the participants had advanced periodontitis with tooth mobility. Thus, the author underlined the importance of the possible effect of tooth mobility to quality of life (Montero-Martin et al., 2009).

There was no statistically significant relationship between the furcation status and prevalence of the impacts. The level of statistical significance of the

relationship between furcation status and severity of the impact on the quality of life was slightly above the cut-off of the statistically significant, p-value = 0.054. Nevertheless, there was a statistically significant association between furcation status and extent of the impact on the quality of life (p-value = 0.026). Literature search regarding the association between teeth with furcation involvement and oral health-related quality of life through the MEDLINE database with keywords “furcation” and “quality of life” was done to compare this study’s findings with the previous studies. However, there were no previous studies which assessed this relationship up until data accessed on 31/01/2020.

Besides periodontal condition variables, this study also attempted to assess the relationship between quality of life with other predictors; such as demographics, socioeconomics background, behavioural, systemic disease, other oral health condition (teeth condition and oral hygiene) and participants’ subjective appraisal toward their dental health. The assessment was based on the OHIP’s severity and extent of the impacts. The severity of the impact gives an illustration of the intensity of the impact based on the total OHIP score. Furthermore, the extent of the impact indicates the number of OHIP’s dimensions affected.

None of the demographic variables (age, gender, and marital status) and systemic disease variables (diabetes status and diabetes time duration) showed a significant relationship with the impact on the quality of life based on both severity and extent of the impacts assessments in this study population.

Behavioural factors consist of brushing habits, smoking status, and pattern of a dental visit. Brushing habits and pattern of a dental visit were correlated with the urban older people’s quality of life. However, smoking status as one of the important risk factors of periodontal disease detected no significant difference in the impact on the quality of life. As a consideration of our result regarding the smoking status is the prevalence of active smoker in this population is quite low, less than 10 per cent. Nevertheless, the overall score of OHIP was

reported higher in both former smoker and active smoker compare to those who have never smoke.

The relationship between brushing habits and quality of life differ significantly based on both the severity and extent of impacts assessments. Urban older people who brushed their teeth at least twice a day rate their quality of life better than those who brushed their teeth less than twice a day. This result was expected as better oral health maintenance can help people to maintain their oral health condition. Our result affirms with a current previous study conducted in Brazil, which reported a relationship between the frequency of tooth brushing and quality of life (Batista et al., 2014a).

The correlation between dental visit and quality of life was showed significant difference according to the extent of the impact. Urban older people who had a routine dental check-up at least once a year reported less quality of life dimensions affected than those who did not have any routine dental check-up. This finding can be understood as regular dental visits allow the dentist to detect oral health problems earlier. Thus dental issues can be treated before they progress into an advanced stage, which may cause an impact into the quality of life. In addition to this, dentists might also offer dental health recommendations and give preventive treatment during the dental check-up, such as scaling and polishing to maintain periodontal health condition. Previous studies have also confirmed the significant association between dental visits and quality of life (Khalifa et al., 2013, Slade and Sanders, 2011, Batista et al., 2014a, Batista et al., 2014b, Lawrence et al., 2008).

Socioeconomic backgrounds examined in this study include educational background and family income. Although educational backgrounds are considered to be one of the essential predictors to assess people's socioeconomic status, the severity and extent of the impact did not differ significantly according to the educational background in the population being studied. On the other hand, family income as one of the predictors reported a significant difference in the quality of life. Urban older people who had income under minimum wage reported more quality of life dimensions negatively

affected compared to those who had income more than the minimum wage. Our result affirms with previous findings which stated financial condition might have a considerable impact on the quality of life (Slade and Sanders, 2011, Batista et al., 2014a, Batista et al., 2014b).

In addition to the periodontal condition discuss above, this study also assessed the relationship between quality of life and other oral health condition predictors, including DMF-T and OHI-S. As predicted, DMF-T was independently associated with quality of life based on the severity and extent of the impacts assessments. There was a significant difference in the intensity of the impact between urban older people who had very low or low DMF-T score and those who had moderate or high DMF-T score. The mean difference between these two groups also indicated a clinically important difference (mean difference = 5.09). Our finding is in accordance with previous studies, which also confirm the important relationship between DMF-T condition and quality of life. Previous studies also confirm the relationship between dentition conditions with quality of life. A recent publication has confirmed the significant association between OHIP-14 global score and DMF-T status (Levin et al., 2018). Another recent publication reported a significant association between the number of remaining teeth and oral health quality of life in the Swedish population aged 70 years and above. A considerable higher total OHIP-14 score was associated with participants having ten or less retained teeth compared to those with 21 and more remaining teeth. This result means a lower oral health-related quality of life of the elderly who had ten or less remaining teeth than their counterparts who retained 11 and more teeth (Kato et al., 2018).

None of the relationships between OHI-S and quality of life assessed in this study shows a statistically significant difference based on the severity and extent of the impacts assessment. The OHI-S score was calculated as the mean of the debris and calculus scores from the present teeth. In the event of a participant did not have molars or incisors of the six segments measured for the OHI-S, that segment was excluded from the OHI-S score calculation. An

increasing number of missing teeth were expected in this older age group sample population. Thus, participants who had lost their molars or incisors might have lower OHI-S score due to the absence of the teeth segments to be assessed. Nonetheless, they might have experienced an impact on their quality of life caused by tooth loss; such as eating difficulties, avoided smiling, and less confident to socialise. The explanation described might be a reason why we have found none significant relationship between the OHI-S and quality of life in this population. This possibility is reflected in our data regarding the mean of missing teeth for each OHI-S categories. Participants with better oral hygiene had more missing teeth in this population; Good oral hygiene condition (mean number of missing teeth = 15.1), Fair oral hygiene condition (mean number of missing teeth = 12.41), and Poor oral hygiene condition (mean number of missing teeth = 12.23).

Subjective appraisal of dental health was independently associated with quality of life. The better dental health subjectively appraised by the participants reflected the lower score of both severity and extent of the impacts. This result was not surprising as OHIP itself is an instrument to measure a person's self-perception of oral health condition and normal life functioning (Slade, 1997b). An earlier study conducted in Sudan confirmed the relationship between self-rated oral health and both the severity and extent of the impacts on the quality of life (Khalifa et al., 2013). Another previous study also found individuals who perceived their oral health as poor showed higher total OHIP score than their counterparts. Self-perceived oral health was statistically associated with seven domains of the OHIP, including functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap dimensions (Palma et al., 2013). Furthermore, Lawrence et al. in their cohort study conducted in New Zealand reported individuals who rated their dental health better than average people in their age had a lower prevalence of the impact than those who reported their dental health worse than the average people in their age (Lawrence et al., 2008).

5.4 Strengths and limitations of the study

The present study exhibits some limitations, such as the classification of the periodontal status into non-generalised periodontitis and generalised periodontitis. We had a small number of urban older people with no teeth with periodontal pocket (n = 11 (3 %)). The rest of the participants were categorised into generalised periodontitis (n = 272 (75 %)) and localised periodontitis (n = 80 (22 %)). The high prevalence of teeth with probing depth was expected in this older population as periodontitis is an age-associated disease. The length of time of periodontal tissue challenged by chronic plaque accumulation increase with age (Newman et al., 2012). In this study, we decided to categorise the periodontal status into two groups for the analysis purpose, which are non-generalised periodontitis and generalised periodontitis. However, future research which categorised periodontal status of the older people into no teeth with periodontal pocket, localised periodontitis, and generalised periodontitis is needed. This more details periodontal status categorisation will hopefully provide a better understanding of the relationship between periodontal disease and quality of life in this urban older population in Indonesia.

Another limitation to this study is the unequal sample distribution between urban older people who did not have generalised periodontitis and those who had generalised periodontitis (ratio 1: 3). Thus, future research with an equal proportion of the participants is needed to give better information and confirmation of the relationship between generalised chronic periodontitis and increased impact on the quality of life in the study population.

As a strength of this study, this study used general population sample with randomised sample for the data collection, rather than being in a population with oral disease. Few previous studies assessing the relationship between periodontal disease and quality of in general population setting. Many of the previous studies undertook the data collection with patients attending dental clinic or hospitals as their participants (Needleman et al., 2004, Cunha-Cruz et

al., 2007, Jowett et al., 2009, Brauchle et al., 2013, Palma et al., 2013, Lawal et al., 2014, Khalifa et al., 2013, Montero-Martin et al., 2009).

In the quantitative data analysis, questionnaire completion was self-administered by the participants or with the help of community health worker for those who could not read. This questionnaire completion was done prior to the clinically oral health examination. This steps of the data collection avoid the possibility of tendentiousness from researchers or dentists in the field to influence the study results.

5.5 Conclusions

Our research did not show a significant relationship between periodontal disease status and oral health-related quality of life. Nevertheless, we found a substantial relationship between teeth mobility status and oral health-related quality of life. All of the OHIP assessments, including prevalence, severity, and extent of the impacts, confirm the relationship between teeth mobility and oral health-related quality of life. In addition to this, our data shows a significant relationship between the tooth furcation and the extent of the impacts on the older people' quality of life, but no difference was seen for the prevalence and severity of the impacts assessments. Tooth mobility and furcation involvement are clinical signs which often appears in an advanced stage of chronic periodontitis.

In addition to the findings, our research showed several predictors might also considerably affect the oral health-related quality of life of the population under study. These several predictors are brushing habits, dental visit, family income, DMF-T status, and subjective appraisal toward dental health.

Chapter 6 Qualitative research: Oral health-related quality of life and periodontal disease experienced by the urban older population in Indonesia

This chapter presents the qualitative research aim and objectives, ensuring rigour in the qualitative data analysis, characteristics of the participants, and research findings regarding the perceived impact of periodontal disease based on urban older population subjective experiences. The discussion, strengths and limitations of the study, and conclusion are also presented in this chapter.

6.1 Aim and objectives

The qualitative research aims to generate an understanding of the relationship between quality of life and periodontal disease in the urban ageing population based on their personal experiences with the periodontal disease.

The objectives of this study are:

- To explore and understand the relationship between periodontal disease and quality of life identified by the quantitative study (Chapter 5) using semi-structured interviews as a qualitative research instrument. The natural setting of the qualitative method allows this study to understand participants' perceptions and experiences with their periodontal disease and how this disease may affect their quality of life.
- To explore and understand the relationship between participant's attitudes, behaviour, and their periodontal disease experiences.

6.2 Ensuring rigour in analysis

This research followed the general principles of rigorous qualitative analysis for the interview transcriptions proposed by Green and Thorogood, which are transparency, reliability, validity, and reflexivity (Green and Thorogood, 2014).

Transparency

The data collection and analysis of this qualitative research were described clearly and explicitly to assure the transparency of the study. The data collection procedures and information about participant sampling can be found in Chapter 3.

Reliability

Two independent coders did the thematic coding for each transcription to ensure the reliability that all potential themes were identified and assure that both coders identified relatively similar themes. The first coder is me as a PhD student, and the second coder is Dr Nina Ariani, a lecturer in the Prosthodontics Department from Universitas Indonesia. Both of coders are a dentist and native Indonesian. A comparison of thematic coding between the two coders was made and discussed to reach an agreement in the themes identified. The two coders reached an agreement on the themes findings for this study without the need for an arbitrator. The themes that were used for coding after the coders reached a consensus are reported and discussed in this chapter.

Validity

In order to maximise validity, the study provides the contextual quotes from the interviewees for a reader to judge the interpretations made by the researchers. Furthermore, simple counts of the themes that emerged from the interviewees are provided where applicable.

Reflexivity

Based on my educational and professional background in dentistry and public health, I acknowledged that I might bring influences to the phenomena being studied. My educational background might shape the research study starting

from designing the interview topic guide up, conducting the interviews data collection in Depok (Indonesia), until analysing the transcriptions of the interviews. I found my previous qualitative research course, training, and the pilot study before the data collection in Indonesia were helpful to prepare myself in arranging, conducting the interviews, and overcome any challenges on the field.

Moreover, I acknowledged the help from the community health workers in the field who helped me in recruiting the participants and preparing a friendly and comfortable setting for the interviewees.

In addition to this, I have shared the same ethnic background as the participants as an Indonesian. The same ethnic background allows me to understand the socio-cultural meanings in the interaction with the participants and see more in-depth insight into the phenomenon being studied.

Although I am a dental professional, the participants were not my patients in a dental practice. Thus, it could minimise a potential influence from the health professional and patient relationships on the shaped of the data being collected.

I understand and completely aware that I am a part of the research instruments which might shape the data collection. To minimise the power of the pre-assumptions before doing the interviews, I did not look at the participants' oral health examination results and their background details before conducting the interviews.

6.3 Characteristics of the participants

There were 32 elderly (17 women and 15 men) participated as interviewees. However, one female participant could not continue the interview as she felt tired. Thus this participant was excluded from the analysis. The age range of the participants was 60 to 80 years old. All participants are indicated by study number from 1 to 32 to assure participants' anonymity. Table 6.1 describes the characteristics of the study participants. Detailed information about

participants involved in the interviews can be found in appendix 6.1. Participants are indicated by their study number, gender, and age for the purpose of quotations in the discussion.

Table 6. 1 Characteristics of the interviewees. The characteristics based on the 31 participants who participated fully in the interviews and were included in the analysis.

Variables	**Details information about the groups of the variables:** • **Sex, BPE score, educational background (*n (%)*)** • **Age (age range (age median))**
Sex	
Female	16 (51.6 %)
Male	15 (48.4 %)
Age	
Female	60-80 (median: 66.5)
Male	60-77 (median: 70)
BPE score	
BPE score 3 (only)	14 (45.2%)
BPE score 3 and above	17 (54.8%)
Educational background	
Never attended formal school	1 (3.2 %)
Not completed elementary school	3 (9.7 %)
Elementary school	5 (16.1 %)
Junior high school	8 (25.8 %)
High school/ vocational school	10 (32.3 %)
College/ University	4 (12.9 %)

6.4 Research findings

Both coders have agreed that these data have reached thematic saturation. Thematic saturation was determined when as at least three consecutive interviews did not elicit new themes or ideas. This was achieved after reviewing 26 transcriptions. To be more conservative, five further interviews were conducted to ensure that the point of saturation had been reached. Researchers did not find any new themes or ideas emerge from these

additional five interviews (interviewee number 28 until 32). Participant number 24 could not continue the interview as she felt tired and therefore excluded from the analysis.

As in the nature of the study, the analysis of this study could not be purely inductive because there are inevitably concepts from previous studies and both thematic coders' experiences in dental field and reading which may influence the themes and findings.

As the interviews progressed, it became apparent that the data gathered from interviews could be grouped into two domains, data related to periodontal disease impact on the quality of life and data related to individual and environmental factors which might affect their periodontal disease experiences. From these data, participants reported the extent of symptoms of their periodontal disease. These symptoms of periodontal disease resulted in impacts on their physical, psychological, and social functions. These impacts of periodontal disease also potentially modified by characteristics of the individuals and their environments. These integrated aspects of the effects of the periodontal disease, individual characteristics, and environmental characteristics affected the urban older people's overall quality of life.

The final themes agreements between the two coders from the 31 participants' transcriptions data can be found in Appendices 6.2 and 6.3. These appendices present the themes and sub-themes identified from the interviewees' transcriptions.

Representative quotes had been chosen to give an illustration of the themes and explain detailed information about participants' periodontal disease experiences. The quotes may contain more than one theme. Thus, they may be used to illustrate several different themes in section 6.4.1 and 6.4.2 because participants might report several signs and effects of the periodontal disease at the same time. The information in parentheses is a participant's study number (SN), their gender (Female / Male), and age. Information contextualizing some quotations or important gestures notice by the

researcher during the interview have been added in squared brackets for clarity when it is necessary. More details information about participant's periodontal condition (BPE scores) and their educational background can be referred to their details which presented in appendix 6.1.

6.4.1 Data related to periodontal disease impact on the quality of life aspects.

There were many themes from the interviews which are in accordance with a conceptual model of oral health-related quality of life developed by Locker. The model explains that oral health conditions are not only seen as a disease status but also involve physical, functional, psychological, and social (Daly et al., 2013, Baker, 2007, Locker, 1988).

Locker's model consists of five components which include impairments, pain and discomfort, functional limitations, disability, and handicap. These five components are sequentially related. Impairment causes a restriction in the body functions, discomfort, and pain, which could lead to disability in physical, psychological, and social life. Furthermore, disability can lead to handicap, a state where a person could not conform to the social group expectations (Daly et al., 2013).

We identified four components of Locker's model during the analysis of these interviews: impairment, pain and discomfort, functional limitations, and disability. However, the fifth element of the Locker model, handicap, was not mentioned by the participants in this study. Some of the thematic findings in this study are interpreted in more than one component of the Locker's model.

The themes findings, which related to four components of Locker's model, are described in details bellows.

6.4.1.1 Impairments related to periodontal disease

Themes emerging from the data analysis were not limited to periodontal disease as participants also reported their other oral health disease experiences. This section will only focus on the reported impairments caused by periodontal disease and will not discuss in detail the findings of other oral health problems. Nevertheless, the themes related to impairments due to other oral health problems are still presented in table 6.4. Impairment is defined as the extent of anatomical loss or structural abnormality (Locker, 1988). The themes and sub-themes related to impairments due to oral health problems experienced by the participants can be seen in Appendix 6.4.

Almost all of the participants mentioned that they had experienced at least one of the impairments which are likely to be related to periodontal disease (29 participants from the total 31 participants (93.5 %). Impairment was often identified as the earliest sign of the impact of periodontal disease on the quality of life. Figure. 6.1 describes the number of participants reporting the impairments.

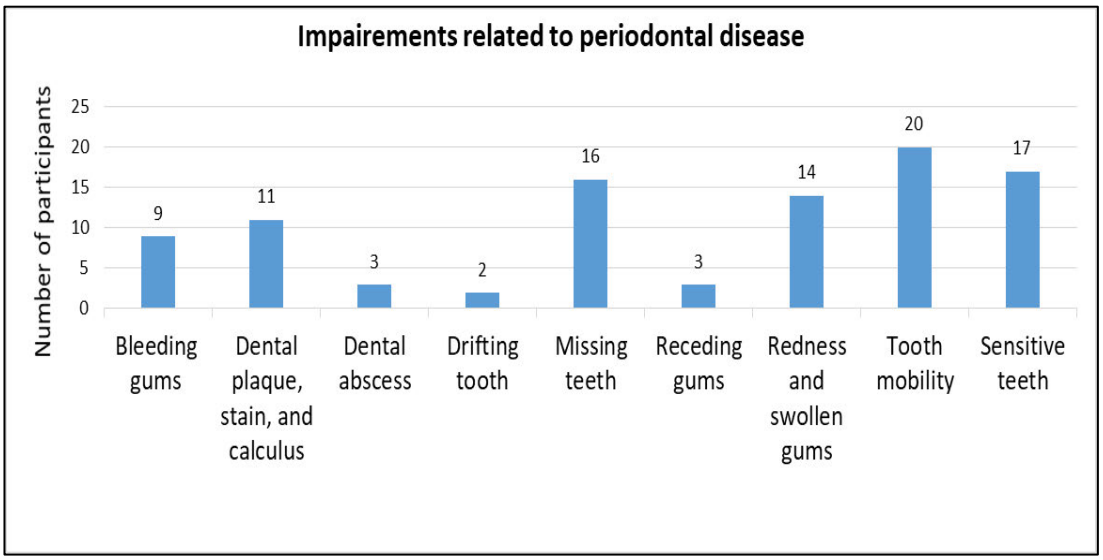

Figure 6. 1 The number of participants reporting each impairment likely due to periodontal disease. Tooth mobility was the most commonly reported impairment, and drifting tooth was the least commonly reported impairment by the participants. The number of total participants was 31 people.

Bleeding gums

Almost a third of the participants said that they had experienced bleeding gums while they brush their teeth. This sign of the periodontal disease was commonly accepted by participants as an inevitable thing while brushing. Bleeding gums were also reported in association with other problems related to periodontal disease, such as loose teeth, swollen gums, and receding gums. For an illustration:

> *'I often have bleeding gums while brushing my teeth. I am not really sure what the cause of it, can it be ulcers? But it might be because I brush my teeth…I eat really carefully and very slowly because I have loose teeth. These loose teeth are often bleed and feel painful. Although they are not always bleed when I am eating, but I am sure they are often bleed while I brush my teeth.'* (SN 18, Male, 73 years)

Dental plaque, stain, and calculus

Several participants noticed that they had dental plaque, stain, and calculus either through looking in a mirror or comments from a family member, and some knew it from their dentists. Some participants did not consider dental plaque and calculus needed any treatment because they did not feel any pain. On the other hand, some participant considered the need to remove the plaque and calculus because they felt their teeth were loose, for aesthetic reasons, socialisation reasons, or because their dentist had recommended it.

> *'I have never had my teeth cleaned by a dentist. I leave it (dental plaque and calculus) like that because it did not bother me. If it causes me pain, then I will go to the health centre to see a dentist.' (SN 1, Male, 76 years)*

> *'I had tartar because it had been twenty years; I did not get a dentist to clean my teeth.'* (SN 12, Female, 66 years)

'Tartar is one of the topics that I often discuss with my friends in the office and the religion study and gathering. Because many of my friends do not want to look that they have dirty and filthy teeth. How many months should we come back to clean our teeth? I guess for me I need to clean my teeth before a year.' (SN 15, Female, 60 years)

Dental abscess

Some subjects reported having abscesses around their teeth. It was not possible on the basis of our clinical data to differentiate between periodontal and periapical infection presenting as an abscess, particularly historically. However, all the participants involved as interviewees had generalised chronic periodontitis, which means they have more than 30 per cent sites of their remaining teeth are affected by periodontitis. Furthermore, bacterial-induced inflammation in the pulpal and periodontal tissues infection are often can be seen together. As an example, root canal infections are likely to spread to the periodontal tissue, which may lead to bone destruction (Newman et al., 2012). Thus, this sub-theme is presented in this section as an impairment related to the periodontal disease, which can affect older people's quality of life. Although dental abscess may cause severe pain, some of the participants mentioned that they did not go to the dentist immediately to sort their problems.

'I had experienced with swollen gums. It was really sore. There was pus as well, which I thought the pus was the reason why it was so painful, and I could not sleep all night. I thought I would wait and hope it would go away. I knew it was a bad idea because it did not get any better. In the end, I still need to see a dentist.' (SN 22, Female, 65 years)

Drifting teeth

Drifting teeth is one of the impairments mentioned by the participants. They felt their remaining teeth moved after they lost some of their teeth.

> *'When I was still working, I had some of my teeth extracted. I did not get any denture to replace the teeth. Now, I have realised that my teeth have migrated to sideways. I did not do anything with my teeth, but they moved by themselves.'*(SN 5, Female, 80 years)

Missing teeth

Tooth mobility was a sign that many participants had noticed before their teeth fell out. Although they may have experienced tooth loss several times, they did not perceive this condition as a disease. Thus, tooth loss is widely accepted by many of the urban older people in Indonesia as an inevitable part of the ageing process.

> *'These teeth eventually fell out by themselves. It was not painful. Maybe it is because they had been outworn and I am old.'* (SN 14, Male, 76 years)

> *'You know it felt like these teeth were loose before they fell out. It fell out suddenly without necessarily I ate anything to trigger that.'* (SN 16, Male, 63 years)

Receding gums

Participants described receding gum as a *longer-looking tooth*. Some participants also suggested that their gum recession resulted in tooth sensitivity.

'It seems like the gums go down. Normally teeth are this size (participant made a hand gesture), but these teeth are long because it grows out of gums. It has been like this for months. At first, I felt my teeth were loose, then through the time they become longer than usual.' (SN 11, Female, 65 years)

'It looks like the teeth stretch time by time. Now, they look longer, and I often feel sensitive teeth.' (SN 30, Female, 71 years)

Redness and swelling gums

Redness and swelling of the gums are indications of gingivitis. Some participants suggested they did not go to a dentist to sort their gums problems even when they were apparent. Furthermore, this condition was mentioned by participants as a recurrent oral problem. They have also described the effects of swollen gums on their well-being, such as pain when chewing foods and alteration of their foods choices. These further effect of swollen gums are discussed in the impact of periodontal disease on the pain and physical discomfort, and physical function limitations sections (see sections*: 6.4.1.2; 6.4.1.3***)**

'My gums are swollen, and there was pus inside the gums as well. I put hot-patch on my cheek…it took me a quite some time until the pus came out of the gums.' (SN 6, Male, 68 years)

'Usually, my gums bleed when they are swelling. First, it starts with swelling gums, then gums bleeding, and after that, my teeth feel brittle.' (SN 10, Female, 68 years)

Tooth mobility

Tooth mobility was the most commonly mentioned impairment by the participants (20 participants). Tooth mobility is an indication that periodontal disease has resulted in sufficient bone destructions with loss attachment that normal biting loads result in significant tooth movement. Many participants suggested that they have experienced tooth mobility for quite a long period, and that this condition leads ultimately to tooth loss. Some of the participants also expressed their preference not to go to the dentist to solve problems related to tooth mobility. They would rather wait until the loose tooth falls out on its own, others preferred to pull their teeth out themselves.

> *'My teeth were loose...I ignored them for a long time until I had swollen gums, and it was painful. Then I went to the dentist, and the teeth need to be extracted.'* (SN 18, Male, 73 years)
> *'I didn't go to the dentist. These teeth are loose now, and I think it won't be long until they fall out by themselves. I won't search for any treatment. It will fall out.'* (SN 29, Female, 70 years)
> *'I have had this problem for quite sometimes now. I think my teeth have been loose for the past three months. I want to get it extracted, but I am too scared. I am afraid there will be side effects after the extractions. Thus, I don't want to do it. I will wait until my teeth fall out by themselves.'* (SN 30, female, 71 years)

> *'It was excruciating to eat with very loose teeth before the teeth pulled out. I pulled the loose teeth by myself. When the teeth were very mobile, then I pulled it out by myself. However, it was difficult for the teeth in the upper jaw because there were lots of nerves, but I managed to pull it out.'* (SN 25, Male, 60 years)

Tooth mobility was also accepted as an inevitable consequence of ageing by some participants.

'My teeth suddenly feel loose because of the age factor. My teeth which had been filled also feel loose.' (SN 13, Male, 70 years)

This condition was also reported as causing pain, discomfort and difficulties with eating. These extents of the impacts of tooth mobility are discussed further in section 6.4.1.2.

Sensitive teeth

Tooth sensitivity with the absence of caries is associated with gingival recession, which may be linked to periodontal disease. As many as 17 participants reported that their teeth are sensitive to hot or cold. Avoiding hot or cold stimuli was described by the participants as their coping strategy for their sensitive teeth.

'I drink water which is not too cold nor too hot because it will cause me pain. Once I drunk cold drinks with my grandson, it was painful.' (SN 14, Male, 76 years)

'The first thing I do after I wake up in the morning is brushing my teeth. I couldn't brush my teeth with cold or usual water now, so I use warm water.' (SN 20, Male, 71 years)

6.4.1.2 Pain and physical discomfort related to periodontal disease

Pain and physical discomfort in this context are defined as physical distress due to the extent of the impairments from chronic periodontitis. Thus many of the sub-themes in this section are similar to the sub-themes in the previous section, impairments related to periodontal disease. These findings are in accordance with the Locker's model, which stated that impairment could lead to pain and physical discomfort (Locker). The themes and subthemes related to pain and discomfort due to periodontal disease are reported in Appendix 6.5.

The types of pain reported by the participants were varied, including painful aching/ acute pain, pain associated with bleeding gums, constant pain associated with a dental abscess, sensitivity to hot and cold foods or drinks, sensitivity while brushing teeth, extreme sensitivity when breathing the air, sensitivity when chewing, pain intensified by eating spicy, hot, oily or sweet foods, and burning sensation in the gums.

Discomfort related to chronic periodontitis were also mentioned by the participants, such as discomfort associated with calculus or missing teeth or loose teeth, and headaches.

Painful aching

All of the participants invited as interviewees had chronic generalised periodontitis, and some of them reported great pain as a manifestation of their periodontal disease. Participants' periodontal pain experiences were mainly associated with tangible symptoms of periodontitis which can be realised by participants, such as periodontal abscess, swollen and bleeding gums, tooth mobility, and gingival recession which cause sensitivity to hot and cold foods. This pain affects participants' quality of life, especially when periodontal disease accompanied by other dental problems.

> *'I had experienced with swollen gums. It was really sore. There was pus as well, which I thought the pus was the reason why it was so painful, and I could not sleep all night.'* (SN 22, Female, 65 years)
>
> *'Perhaps if the teeth come out, I will be better. Now, my teeth are very sensitive to any frictions. Every time I brush my teeth, I feel pain because the toothbrush wiggles my loose teeth. Yesterday, I could not do anything or eat anything because all of my teeth were sensitive. It really ached, I did not know how to eat with my teeth.'* (SN 11, Female, 65 years)
>
> *'My teeth are sore when I drink hot or cold drinks. The excruciating pain made me felt upside down. Everything seemed wrong to me, especially when my teeth came off by themselves. It was unbearable. I couldn't eat*

and drink. I couldn't sleep. Even, I felt angry when I hear the music.' (SN 16, Male, 63 years)

'I personally think that a toothache is the most troublesome ache. The pain is awful, but no one will visit you because you have a toothache, not like other serious general health problems. The truth is I always feel angry if there is noise when I have a toothache. Your friends won't visit you like "Oh, let's visit her because she has a toothache now". You won't get that kind of attention from your friends. That's what I think. Lately, my gums are often swollen, and it hurts. I believe this is because I am getting old.' (SN 31, Female, 60 years)

Pain and physical discomfort related to bleeding gums

Although nine participants were aware that they had bleeding gums, only three participants described pain and discomfort associated with their experience of bleeding gums. These participants were also reporting other sign of periodontitis, which accompanied the bleeding gums, such as loose teeth and swollen gums. For an illustration, participant below reporting that he has bleeding gums and loose teeth which cause him pain when eating his foods.

'I eat really carefully and very slowly because I have loose teeth. These loose teeth are often bleed and feel painful.' (SN 18, Male, 73 years).

Pain and physical discomfort related to a dental abscess

Pain, suppuration, and tooth mobility were symptoms related to a periodontium abscess mentioned by some participants. The acute and constant pain from a dental abscess had affected participants' activity, such as difficult to fall asleep.

'I had experienced with swollen gums. It was really sore. There was pus as well, which I thought the pus was the reason why it was so painful, and I could not sleep all night.' (SN 22, Female, 65 years)

'It felt like nut nut nut from the inside, and then the teeth were loose. There was pus, and my gums were swollen. The pus came from my swollen gums.' (SN 30, Female, 71 years)

Pain and discomfort related to sensitive teeth

Participants who mentioned that they had sensitive teeth also described the extent of the sensitivity that affected their well-being; such as avoiding any hot and cold food and drink, cannot eat and drink properly, feeling pain when breathing the cold air, feeling sensitive teeth without any triggers, and also affect their emotional state.

'Cold and hard foods are always causing me pain. Up until now, I cannot drink or eat something cold.' (SN 02, Female, 64 years)

'I felt my teeth were very sensitive yesterday. I cannot do anything. I cannot eat because it was too sensitive.' (SN 11, Female, 65 years)

'My teeth are very sensitive. Sometimes, I can feel ouch painful when I breathe the air. I can still bear the pain because this kind of pain is come and go.' (SN 12, Female, 66 years)

'My teeth are sensitive every time I drink cold or hot water. I felt my world turns upside down when I have sensitive teeth. Everything seems wrong, especially before the teeth fell out. It was terrible before they fell out. I cannot eat. Even drinking was very painful as well. I could not sleep as well. Even hearing music made me angry. Sometimes my teeth can become very sensitive just because there is contact with my own saliva.' (SN 16, Male, 63 years).

Pain and physical discomfort related to receding gums

Receding gums brought pain and discomfort to the 'participants' normal activities of daily living, such as discomfort when brushing teeth. Participants perceived an exposed root surface due to the extent of gingival recession made their teeth look longer than it was before. They had also experienced tooth mobility alongside the receding gums that cause discomfort.

> *'It feels really ache because my teeth are stretch. They were short, but now they look long. Sometimes they fell out by themselves when I brush my teeth.'* (SN 30, Female, 73 years)

Pain and physical discomfort related to redness and swollen gums

Participants described the various effect of redness and swollen gums on their daily life, such as pain when chewing foods, limitation of speaking, and feeling easy to get angry or more emotional.

> *'I had a headache and I felt angry when someone spoke to me. That was what I felt. I didn't think it came from my teeth, but I saw that my gums were all red, so it was painful when I ate my food.'* (SN 23, Female, 65 years)

Pain intensified by eating spicy, hot, oily or sweet foods and burning sensations caused by redness and swollen gums were also perceived by the participants as a disturbance to their daily life.

> *'I feel my gums are really sore if I eat oily or sweet foods and especially spicy foods.'* (SN 8, Male, 63 years)

> *'My gums are red as if it has been scuffed. I normally drink hot water as it could make my teeth insensitive so that I can eat. Once I felt a burning sensation, I noticed that my gums look red. People said maybe it is because I don't eat enough fruits. "That is because you don't eat enough*

fruits, so you don't get enough vitamins". I said "Yes, that might be true…but you know I am an old grandma now…maybe it is just because I am old now. ' (SN 23, Female, 65 years)

One of the participants shared her traumatic experience with redness and swollen gums when she was pregnant in the past. She felt it was horrible that she could not speak as usual because she had swollen gums, which caused her great pain.

'The problem was I couldn't work, I just couldn't…I even couldn't speak. I couldn't eat. I couldn't get up from my bed. I felt my cheek was heavy. My gums were swollen so big. It felt heavy. I didn't understand why a toothache could be this awfully painful when I was pregnant.' (SN 2, Female, 64 years)

Pain and physical discomfort related to tooth mobility

Mobility of teeth was recurrently expressed and accepted by some participants as an inevitable consequence of ageing. Some of the participants have experienced several episodes of tooth mobility and end up with teeth loss as the ultimate manifestation of their chronic periodontitis.

'Now I am old. I am almost 70 years old. My teeth have become loose.' (SN 9, Female, 67 years)

'My teeth were mobile for sometimes before they fell out. I can eat as usual without problems, but I can only use this side [pointing out right side] because my teeth are loose so I can't chew in this side (left side).' (SN 16, Male, 63 years)

Impact on chewing ability and discomfort while brushing teeth were among reported problems associated with mobility of teeth.

'I feel pain every time I brush my teeth because the brush shakes my wobbly teeth.' (SN 11, Female, 65 years)

'It is bothering me, especially when I eat. It is painful to chew food with my front teeth because I can feel pressure on it. It is hurt if the food comes in contact with these loose teeth.' (SN 18, Male, 73 years)

Despite tooth mobility evoking some problems and discomfort to participants' some of them did not want to go to a dentist. These participants preferred to wait until the teeth fell out or pull out the teeth by themselves.

'I pulled out my teeth three times because it felt really wobbly, but I didn't feel any pain…I shook the teeth, then pulled it out. I have done that three times until now as I remember. They were wobbly. It seemed there was only one sheet which connected to the gums, to the nerves or whatever. It didn't hurt before I tried to pull it out, then I twisted like this (show some gesture of hands). I felt some pain up until my head, my brain, or to the nerves. I wasn't sure. There was a little bit of blood came out as well.' (SN 18, Male, 73 years)

Physical discomfort related to calculus

Dental plaque is an accumulation of bacteria adherent to the dental surface. Many participants did not mention any pain associated with dental plaque. This can be understood as participants were only aware and noticed the pain when the dental plaque progress into gingivitis (e.g. red, swollen, bleeding gums) and periodontitis (e.g. tooth mobility, tooth loss, periodontal abscess). However, participants' reported some physical discomfort related to the calculus formation in their mouth.

'I have to clean my tartar because they are really disturbing me. I think I have to start to go to a dentist every six months to clean my tartar and also sort my cavities. My teeth have become loose because of the tartar. I tried to clean it when I brushed my teeth, but it was so hard to remove them.' (SN 22, Female, 65 years)

'I have got something in my molars in the upper and lower jaws…It seems something fell out after I rinse my mouth. I do not know what it is exactly,

but perhaps this is what people called tartar. We cannot see inside our mouth, right? But I can guess the tartar location. I thought I have to brush this away until clean. I thought my teeth would be clean if I brush it over and over again, but I am not sure about it.' (SN 23, Female, 65 years)

Headaches

The participants perceived headache as a disturbance to their daily life. Headaches were reported accompanied by other oral health-related problems that affected participants' quality of life, such as restriction in speaking, inability to sleep, pain when chewing foods, and affects on both mood and emotion.

'I felt like my teeth in the upper and lower jaws clashed. Even though I wasn't trying to close my mouth. Perhaps because I had swollen gum, I felt my teeth clashed, and then it went to my head. Really painful. I didn't even talk or do anything, but they just clashed. It was awful. I couldn't speak, so I didn't want to speak at all. No, you didn't want to talk to anyone.' (SN 2, Female, 64 years)

'My chief complaint was dizziness and headache. I became more emotional when hearing people talk. I didn't think the pain came from my teeth, but it came from my gums. My gums were so red, so I couldn't eat as it causes me pain.' (SN 23, Female, 65 years)

6.4.1.3 Functional limitations and physical activity restriction as a result of periodontal disease

Awareness of functional limitation and physical activity restrictions relates to a limitation of the normal function of the mouth, which has an impact on participants' daily living.

The themes emerged related to functional limitations and physical activity restrictions were caused by both periodontal disease and other oral health problems.

This section will only focus on the functional limitation related to periodontal disease experiences. Although this section will not discuss the details findings of the functional limitation due to other oral health problems, the themes are still presented in Appendix 6.6. Appendix 6.6 reports various functional limitations experienced by the participants.

Bad breath

Participants mentioned unpleasant breath odour as one of the disturbing functional limitations in their daily life. Some participants have subjective perceptions that they have bad breath. They knew this by smelling their own breath. While others had been told that they had bad breath by their family. This condition has an impact on participants' self-confidence. In addition to this, feelings of embarrassment were linked with this condition affecting their social interactions with others.

Some participants perceived that tooth decay might also contribute to the bad breath. Participants also mentioned external causes of unpleasant breath, such as smoking and eating strongly flavoured foods, but these have been excluded from the analysis.

Some of the participants mentioned their effort to mask or cover the oral malodour by using a mouth rinse, chewing gum, covering their mouth if speaking to someone nearby, and rinsing with traditional herbal medicine. However, no one mentioned that she or he had gone to a dentist to overcome their bad breath problem.

> *'My wife said, "Your mouth is smelly, don't forget to chew the chewing gum". She always provided me with chewing gum. Before I went here, she also reminded me to take the chewing gum from the cupboard.'* (SN 7, Male, 77 years)

> *'I think we will feel comfortable to talk with others if we have healthy teeth. That is obvious. We can interact with others comfortable. Especially*

because I run a small shop, I feel uncomfortable to talk with my buyers when I have bad breath.'(SN 8, Male, 63 years)

'I usually rinse with mouthwash because I know I have bad breath. That is my own feeling that I have breath malodour when I talk.' (SN 11, Female, 65 years)

'Sometimes, I feel insecure when I talk with others. I am afraid my mouth is smelly…then they will make a gesture to cover their nose. I feel terrible. I need to know how I can eliminate this bad breath so people won't smell it.' (SN 28, Male, 71 years)

Cannot chew foods properly

Tooth mobility and gaps in the dentition from missing teeth were mentioned by some participants as the leading cause for their not being able to chew their food properly. Some participants also realised that their chewing function problems affected their eating enjoyment.

'I have got lots of missing teeth. I know that I should have denture to help me comfortable to eat again and to stop the remaining teeth become mobile.' (SN 12, Female, 66 years)

'I don't feel comfortable when I am eating because I have got lots of missing teeth. I can't chew my foods, so I can't enjoy eating anymore. If I still have more teeth, it will be more comfortable for me.' (SN 18, Male, 73 years)

'I feel these loose teeth are bothersome. I couldn't eat hard texture foods. I need liquid to be able to eat. I just swallow the foods if it is hard texture foods. I could not chew it.' (SN 30, Female, 71 years)

Eating on one side only

Ten participants reported that they could only chew on one side of their jaws because of either missing or loose teeth or because they thought their teeth were brittle. The quotations below are only focused on tooth mobility and missing teeth which have an association with periodontal disease.

> *'Maybe because I have lost many of my teeth, so I don't feel comfortable to chew…well, I couldn't chew my foods properly.'* (SN 18, Male, 73 years)

> *'I can't eat with this side [right side of the jaw]. If I chew with this side, I can feel my teeth mobile, and it hurts. So I only eat with this side* [left side of the jaw]*.'* (SN 27, Male, 68 years)

> *'I couldn't eat with this side [right sides]. I couldn't chew. However, I can use my left sides. I am afraid my mobile teeth will be broken if I use it to chew.'* (SN 11, Female, 65 years)

Food catching between teeth

Some subjects reported that food getting caught in between teeth was a problem resulting in a functional limitation while eating. Brushing, using toothpicks, using fingernails, gargling were mentioned by the participants as ways of removing foods trapped in between teeth.

> *'I always use toothpicks after eating. I am afraid the rice will be stuck there.'* (SN 3, Female, 66 years)

> *'It is often that chicken meat stuck in between my front teeth. I have to use my nails to remove them from my teeth.'* (SN 7, Male, 77 years)

> *'I have loose teeth, and it is bothering me when I am eating my food. I feel pain because of the pressure of the food when I bite with my front*

teeth. It is also hurt if the foods stuck in between the teeth.' (SN 18, Male, 73 years)

Altered eating and food choice

Various oral health problems were perceived by the participants as contributing towards dietary restriction or eating difficulty. These included eating restrictions which potentially caused by periodontal disease (dental abscess, inflammation and swollen gums, tooth sensitivity, tooth mobility, food getting trapped between teeth and missing teeth), as well as other oral health problems (brittle teeth, cavities, tooth fracture, and retained roots).

Eating softly textured foods, chewing on one side of the jaws, avoiding hot or cold foods, and accepting oral health problems likely related to periodontal disease as a part of the ageing process were participants' ways to cope with their eating difficulty caused by their tooth loss, tooth mobility, and sensitive tooth.

'There are several foods that I couldn't eat anymore because the texture is hard and uncomfortable to chew, such as any kind of meat. So normally I only eat the soft texture foods which are comfortable for me to chew, such as tempeh and tofu.' (SN 18, Male, 73 years)

'I only eat what I can still eat. If I don't know what to eat, then I will eat porridges.' (SN 10, Female, 68 years)

'I have loose teeth, so sometimes it is hurt to chew with it. Thus, I only use my right side. I don't want to use the left side of my jaws.' (SN 20, Male, 71 years)

'I am avoiding hot foods because it can cause me pain. I am also avoiding any foods with vinegar and hard texture foods.' (SN 22, Female, 65 years)

'It is difficult for me to eat any foods now. It seems "Oh, I really want to eat crisp, but I can only chew it with my front teeth". So I eat really slowly now, I couldn't chew properly like it used to be. Then I said to myself "Ah perhaps this is just a normal thing as people grow old".' (SN 5, Female, 80 years)

Altered drinking

Some of the participants also mentioned the difficulty during drinking. They perceived that drinking water could make their teeth felt sensitive, especially when they drank hot and cold beverages.

'My teeth are sensitive every time I drink cold or hot water. I felt my world turns upside down when I have sensitive teeth. Everything seems wrong, especially before the teeth fell out. It was terrible before they fell out. I cannot eat. Even drinking was very painful as well.' (SN 16, Male, 63 years)

Difficulty in falling asleep

Difficulty in falling asleep was reported associated with acute dental pain and with severe periodontal disease manifestations, such as a dental abscess, swollen gums, and tooth mobility.

'I had experience with swollen teeth…Oh, I mean swollen gums. It was terrible. I supposed there was pus as well, so I couldn't sleep all night. I was stubborn, so I thought I could just wait and see "Ah, perhaps it will get better tomorrow"…but then it became worse. In the end, I went to a dentist.' (SN 22, Female, 65 years)

'All of my activities were interrupted. I couldn't do anything. Even sleep felt wrong and still painful. That was awful that I couldn't do my activities. I couldn't do anything before the teeth came out by themselves.' (SN 16, Male, 63 years)

Limitation or unable to do daily activities

Limitation or restriction in undertaking activities of daily living was reported by some participants, such as inability to work, avoiding household chores, inability to speak, inability to eat, unwillingness to get out of bed, and avoiding interactions with others. Some participants could point out the oral health problems which they suspected as the cause of their restriction in undertaking activities of daily living but others did not. Pregnancy-associated gingivitis, tooth decay, redness and swollen gums, and loose teeth were among the cause of restriction to daily life remembered by the participants.

> *'That was a big problem for me…I couldn't work. I couldn't speak. Especially, I couldn't eat. I couldn't get up from my bed. I felt I had a fever, so I didn't want to take a shower at all. My body was feverish, and I felt my cheek was so heavy.'* (SN 2, Female, 64 years)

> *'It was disturbing for me. I couldn't sleep. I just lightly rubbed my cheeks. I think toothache is the most troublesome disease. You can get a headache as well. Ooh, I preferred not to cook at home. I didn't want to do anything.'* (SN 23, Female, 65 years)

6.4.1.4 Psychological discomfort as a result of periodontal disease

The impact of periodontal disease is not limited to physical function, but also psychological function. The reported problems related to the impacts of periodontal disease on participants' psychological well-being can be divided into psychological discomfort and psychological disability. This section focuses on the psychological discomfort. Psychological discomfort is defined as self-reported psychological distress and uncomfortable feelings experienced by the participants. More than half of the participants reported that they had experienced some psychological discomfort which they associated with their periodontal disease.

Self-conscious about having bad breath or dirty teeth.

Nine participants reported that they have aware that they have bad breath or dirty teeth, and this affects their social interactions with others. Strategies to cover up their unpleasant breath were described in the quotations below:

> *'It is frequent at the church; someone said, "Please come a bit closer, so we can talk more comfortable". I was afraid they could smell my bad breath, so I preferred not too close to the others. Then they were the ones who came approach me. I said, "Please don't come too close to me, I am afraid I have bad breath.".'* (SN 7, Male, 77 years)

> *'In adulthood up until now, I am always sure that my mouth has a bad odour. Because of that, I do this to avoid people notice my breath [make a hand gesture covering his mout]) when I need to talk more closely with people.'* (SN 8, Male, 63 years)

Having tartar was one of the reasons why some participants were self-conscious about having bad breath.

> *'I even a bit shy to breathe sometimes because I can smell the bad breath by myself. Thus, I think I need to go to a dentist to clean my tartar so that I don't have too many bacteria in my mouth.'* (SN 22, Female, 65 years)

Anxiety about losing mobile teeth.

These data described how having a loose tooth affected participants' social function, such as reluctance to eat certain foods in public.

> *'I was at my friend's house. She asked, "Would you like to eat something?" I replied "No, I am fine. I currently have loose teeth". I was so afraid that my teeth would fall out there.'* (SN 9, Female, 67 years)

Participants also reported their coping strategies for eating with loose teeth.

> *'I am afraid my teeth will be broken if I eat hard texture foods. I concern it can cause my teeth fell off. Thus, I only eat soft foods. If I cook meat, I will cook it until it is very tender. The same things for chicken as well, until it is tender and soft.'* (SN 21, Female, 76 years)

> *'I have noticed that my teeth have been mobile in the past year. I thought there were two loose teeth. One of them was really loose, so the dentist pulls that out. However, the other one is still quite good. Now, I feel uncomfortable when my upper jaw teeth meet the lower jaw teeth. So, I tend not to use my teeth and really careful when I am eating.'* (SN 12, Female, 66 years).

Worry about fainting possibility

One of the participants reported that recognising she had bad bleeding gums made her afraid and worried that she could lose consciousness.

> *'I didn't feel dizzy, but I felt I could faint because too many blood came out [from her gums]. I didn't feel any pain or dizzy, but just afraid of fainting.'* (SN 4, Female, 68 years)

Poor appearance

Missing teeth, calculus and plaque, and tooth staining are the main concerns that can reduce participants' self-confidence in their appearance and affect interactions with others.

> *'Obviously, my teeth condition disturb me, especially when I smile or talk. I feel fine when I am eating. I don't feel any pain or something sore with my teeth. However, I feel lacking a pleasant look. Because of this, I don't dare to laugh wide open.'* (SN 16, Male, 63 years)

'If I am aware, then I close my mouth. I feel shy because I have got lots of missing teeth. In the past time, I feel free to express myself, but now I am quieter. I have lost many of my teeth. I can see it when I look in the mirror. It looks like I am toothless. If I remember, then I will cover my mouth. I think there are only two teeth left when I laughed. I free to laugh when I was younger because I had all my teeth. So, yes I don't feel confident because of it.' (SN 27, Male, 68 years)

6.4.1.5 Psychological disability as an impact of periodontal disease

Psychological disability in this context refers to detrimental changes in an individual's mood or emotion as a result of their experiences of chronic periodontitis. Eleven participants mentioned that they were more likely to lose their temper and avoided social interactions with others as an impact of their chronic disease. This disturbance to the psychological state of the participants was mainly due to pain and functional limitations caused by their periodontitis. Moreover, some participants also reported other oral health problems alongside their periodontal conditions as the factors which may cause pain and disturbance to their mental state.

Affect mood and emotion

'*I felt pain all over my body. Even ears and eyes were also painful when a toothache came. The pain was spreading to my head. I didn't want to hear any noise. It was immediately so painful. Ouch! I only wanted to sleep all day. I thought if I closed my eye, the pain would go away. However, the pain was still there when I open my eyes. I couldn't go to work nor eating. I was easy to get a temper and feeling angry. I couldn't hear any noise.'* (SN 27, Male 68 years)

'I didn't want to eat and drink. All I want was just sleep. If someone wants to talk with me, I tend to avoid it as I didn't want to talk with anyone when I have got a toothache. I felt I didn't have any interest to talk with anyone.' (SN 2, Female, 64 years)

6.4.1.6 Social disability due to oral health problems

In addition to impacts on physical oral function and psychological state, participants also perceived that their social life was affected negatively by chronic periodontitis. Avoiding interactions with others and decline in self-confidence were among the reported social disabilities mentioned by the participants.

Affect interaction with others and self-confidence

Bad breath was reported to cause difficulty for participants in doing their regular social interactions with others, such as getting along at a social event or communicating with others at work. Loss of multiple teeth also changed how participants interact with other people as they were concerned about the impact of tooth loss on their appearance. Bad breath and poor appearance were also perceived by participants as an irritating factor affecting their self-confidence.

> *'It is frequent at the church; someone said, "Please come a bit closer, so we can talk more comfortable". I was afraid they could smell my bad breath, so I preferred not too close to the others. Then they were the ones who came approach me. I said, "Please don't come too close to me. I am afraid I have bad breath."* (SN 7, Male, 77 years)

> *'Obviously, I feel the reluctance to smile when I talk with others. Cause I still have that insecurity feeling and shame about my teeth.'* (SN 16, Male, 63)

> *'Normally, I cover my mouth with my hand when I am aware. I feel shame because I have got lots of missing teeth. I feel really different than who I was before. I was confident, but I feel shy now. I can see that I lost so many teeth when I look in the mirror. I think it looks like I only got two teeth when I smile. In the past, I can laugh freely because I still have all of my teeth, but now there is a lack of confidence feeling.'* (SN 27, Male, 68 years)

6.4.2 Data related to individual and environmental factors which may affect periodontal disease experiences

Personal and environmental factors are unavoidable factors which may influence someone's oral health, including periodontal condition. All the participants shared their attitude toward oral health, daily behaviour, subjective oral and periodontal disease experiences, and environmental aspects which may have influenced their periodontal disease experiences.

6.4.2.1 Oral health maintenance

Brushing teeth with toothpaste was suggested by all participants as their way to maintain oral health. This finding is not surprising as brushing teeth is essential oral health maintenance in modern life. However, the frequency of brushing teeth each day varied for each person. All of the participants were using a regular dental brush, and none of them mentioned an electric toothbrush.

Figure 6.2 illustrates all the oral health maintenance reported by the participants and the details about their tooth brushing frequency.

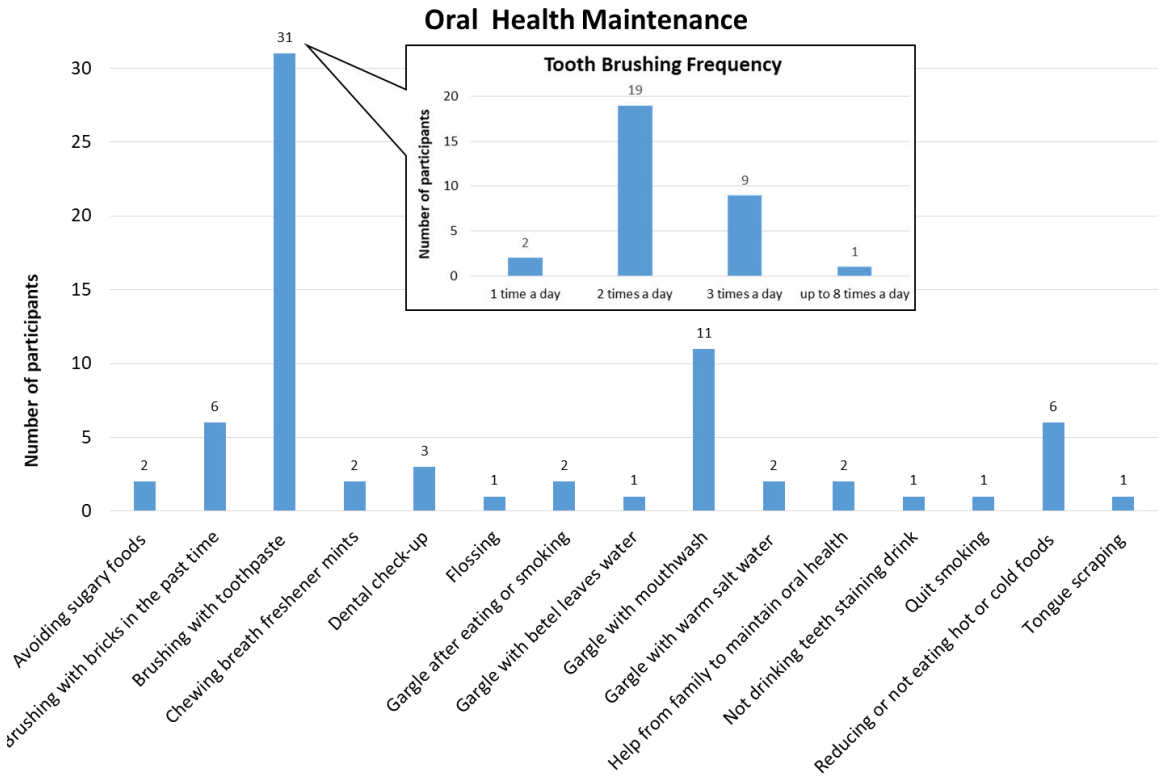

Figure 6. 2 The number of participants reporting each oral health maintenance option currently or previously. Brushing and gargling with mouthwash are the most common practices used by the participants to maintain their oral health. The details about participants tooth brushing frequency are also given in the small figure above.

Although brushing teeth was agreed by all the participants as the best daily maintenance to clean their teeth, two participants reported that they only brush their teeth once in a day. These two participants did not consider it important to brush their teeth twice a day. Twenty-four participants followed the recommended practice to brush their teeth, which is brushing teeth at least twice a day; one at one occasion during the day and one as the last thing at night before bedtime. Meanwhile, the remaining five participants mentioned that they brushed their teeth at least two times a day during the day only, but not before bedtime.

Interestingly, some participants reported that getting older can be a motivation to brush their teeth more often. Other things which can be reasons for

participants brushing their teeth are socialising and before doing religious activities.

> *'I feel too lazy to do that [brushing teeth two times a day]. I feel once in a day will be enough, the one before bedtime. I am just lazy, but I can brush my teeth twice a day when I want. Normally it will be in the morning and afternoon. I will brush my teeth if I eat strong smelly foods, such as bitter bean…or if I need to see my friends or if I have wedding invitations. Besides those things, I only brush my teeth once in a day.'* (SN 27, Male, 68 years)

> *'So, what I do routinely is brushing my teeth. I do that after I realised that I am old like this. Now, I brush my teeth more often at least three times a day.'* (SN 8, Male, 63 years)

> *'I brush my teeth in the morning after I wake up. Yes, I do that every bath time in the morning. Moreover, as a Muslims, every wudu we clean our teeth, sometimes I used toothpaste and sometimes I don't.'* (SN 19, Male, 75 years)

Uniquely, six participants mentioned that they used to use bricks dust to clean their teeth instead of toothpaste in the past. Brushing with bricks dust was passed down by the previous generations.

> *'I think many people in the past rarely used toothpaste. They normally used coconut fibre [as a toothbrush] and red bricks dust [as toothpaste] to brush their teeth. That was enough to make our teeth clean. I did that as well during my childhood. I was born in 1953.'* (SN 23, Female, 65 years)

The second most common way to maintain oral health is gargling which was reported by sixteen participants. Eleven participants mentioned that they had used mouthwash and five other participants said they had used other things (water, warm salt water, and betel leaves water) to rinse. Mouthwash was perceived by these participants as helpful to reduce bad breath and tooth sensitivity.

'My teeth have become like this because I used to eat many sour foods in the past. Thus, I have sensitive teeth now. I feel the pain as well. I rinse my mouth with either Listerine or Betadine to overcome the sensitivity.' (SN 22, Female, 65 years)

'I usually rinse with mouthwash because I know I have bad breath. That is my feeling that I have breath malodour when I talk. So I rinse with…I forget the brand of the mouthwash. I bought it at Indomart shop.' (SN 11, Female, 65 years)

'I always gargle after eating sweets, such as candy, because of my previous experiences with a toothache after eating sweets.' (SN 10, Female, 68 years)

'I think after smoking our mouth smells unpleasant, I know nicotine is dangerous for our health. Thus, I always drink or rinse with water after smoking. I hope it can reduce my bad breath because we will feel uncomfortable to talk with people if we have smelly breath.' (SN 26, Male, 65 years)

I brush my teeth up until they are cleaned, then rinse with warm saltwater.' (SN 28, Male, 71 years)

'I routinely gargle with betel leaves water twice times in a week. I put three leaves of it and pour hot water. I will wait until it is cold in the evening, around 8 pm, then use it to rinse my mouth. I pick the leaves by myself because I have planted it near my home, one is near the ditch and the other one near the septic tank.' (SN 14, Male, 76 years)

Participants also suggested other things that they had done to clean their mouth and maintain their oral health in smaller numbers.

Avoiding sugary foods, reducing eating hot and colds foods, chewing breath freshener gums, and avoiding drinking tooth-staining drinks were considered necessary for maintaining oral health by some. Appendix 6.7 illustrates

quotations regarding various oral health maintenance suggested by the participants.

6.4.2.2 Source of oral health information and behaviour in seeking oral health information

More than half of the participants considered that dentists and health professionals were their primary source for oral health information. Besides dentist and health professionals, participants also indicated family and friends, neighbours, television and newspapers as their sources of oral health information. Other possible resources mentioned by the participants were books, posters and leaflet at health facilities, community organisation, information given at office events, a school in the past, website, *YouTube* and social media. Appendix 6.8 elucidates quotations regarding various oral health information resources suggested by the participants.

Five participants reported that they were not aware of anywhere that they could access information about oral health. These participants had a passive approach to seek oral health information. They reported that they did not have oral health information because no one informed them about it.

> *'I have never received any information about teeth and mouth up until now. The dentist just treated my teeth, but he didn't give me any explanation.'* (SN 17, Male, 64 years)

Three participants also suggested that they did not feel a need to get information about oral health. These participants showed some ignorance about oral health and gave subjective reasons for their acts of ommission, such as not feeling any (dental) pain or only had few remaining teeth.

> *'Yes, because I did not feel any toothache.'* (SN 3, Female, 66 years)

> *'No, I don't want to know any information. Information? What is that for…because I have only a few teeth left. I only have front teeth, and I don't have any molars now.'* (SN 32, Female, 73 years)

On the other hands, some participants indicated that they were actively seeking information about oral health for preventive reasons and to overcome dental problems.

> *'We can get information about oral health from social media, television, and now there is YouTube…there is so many information to maintain teeth and mouth.'* (SN 8, Male, 63 years)

> *'I want to know more about oral health. Sometimes the dentist was in a hurry at the dental practice so he couldn't give you information, but I can google about oral health. There is a technology called Google now. It provides any information you want to know. We can ask, Google.'* (SN 15, Female, 60 years)

> *'I often ask the dentist when I went to the health centre. For example, when I had my tartar cleaned, I asked about what things I can do to prevent tartar in the future.'* (SN 25, Male, 60 years)

> *'I felt I had a toothache for a long time, so I needed to know how to overcome the pain. I asked others. I thought it wasn't wrong to ask other people experiences with a toothache. Perhaps their solutions work for me as well. I said "Do you know how to get rid of a toothache? She answered, "Oh, I often had a toothache in the past, but now I have used the sap of Jatropha leaves ". Then I said "Where I can find it?" and she said, "I have lots at my home". I asked "How to use it? "She said we only need to put the sap on cotton then place it at the painful area inside the mouth.'* (SN 5, Female, 80 years)

6.4.2.3 Care and treatment used to overcome oral health problems

Twenty-four participants considered going to a dentist as the best way to treat their oral health problems. Pain and tooth mobility were among the primary motivation for these participants to go to a dentist.

'My husband often got confused because I had a toothache all the time. I had swollen gums as well. Fortunately, the health centre was close to my house. Thus I could go back and forth. Every few days, I went to the health centre when I ran out of the prescribed medicine.' (SN 2, Female, 64 years)

'I have learned from my experiences…I have lived in Cilandak for a quite long time. This housing complex is near to the Marine Hospital. I will go to the hospital when I have a toothache at any time. Moreover, my neighbour is a dental nurse in the hospital. Once I couldn't stand with a toothache, so I went to her house. Then, she brought me to the hospital, and she opened the dental office. She has the authorization to open the dental office. I felt in great pain at the moment. I felt so dizzy, headache, and in terrible pain. I knew that the toothache was a sign that there was a problem inside my mouth, but I felt pain all over my body.' (SN 10, Female, 68 years)

'So because I am old, I am almost 70 years now, I will go straight away to a dentist if I have felt that I have loose teeth. The dentist in East Depok, but I forgot her name.' (SN 9, Female, 67 years)

Only two participants considered regular dental check-ups as essential to try to preserve their oral health, both had a university educational background. This difference may be related to better health awareness in those people who have higher education than the rest of the participants. In addition to this, there was one participant who also reported that he had had routine dental check-ups while he still working for a government institution, but had stopped when he retired.

'I will go to the dentist at least once in six months, but if I need to, I can go to the dentist once in three or four months. At least I will go to the dentist three to four times a year.' (SN 15, Female, 60 years)

'I used to have general and oral health check-up while I was still working. Yes, check-up. It could be every six months or annually. However, I rarely

go for a check-up after I have retired.' (SN 19, Male, 75 years)

Besides going to the dentist and other dental health professionals to treat their oral health problems, participants also suggested various other self-care strategies to overcome their oral health problems. Surprisingly, we also found an extreme way to overcome dental issues mentioned by the participants; two participants reported self-tooth extraction as their coping strategy. Appendix 6.9 illustrates quotations regarding various self-care to overcome oral health problems mentioned by the participants.

Many participants indicated that self-care strategies were the first thing they had done to overcome their oral problems. Some also considered following up their self-care by seeing a dentist for further treatment if required, especially if their problems did not resolve. However, some of the participants did not consider going to a dentist even though their problems did get worse. These participants reported that they preferred to endure the pain.

> *'After quite sometimes I didn't have any loose teeth, all of a sudden my teeth were loose again. Maybe it was because I often ate hot foods. I didn't notice until I felt my teeth had started to feel loose. They were rocking until I felt uncomfortable, then finally I went to the health centre to overcome this problem.'* (SN 12, Female, 66 years)

> *'So I continue chewed betel leaves and saga leaves. Chew the leaves again and again until the pain went away. That's it. Usually, the pain disappeared after one day. I had swollen gums for one day, and then it would immediately disappear. Thus, I have never go to the dentist.'* (SN 21, Female, 76 years)

One participant decided to go to unqualified person to get solved his poor appearance due to missing teeth.

> *I used to have a denture. Once I went to a wedding invitation, I ate there. I had temporary denture. I had two denture here and one* here [pointing

out his front teeth of the upper jaw]. *I ate dodol*[2] *and it caused my teeth to stick out. Oh, I was so embarrassed. The dodol was very sticky. The denture was stuck out, and I didn't realise. The denture was made by an unqualified person because I needed to cover my missing teeth*.' (SN 27, Male, 68 years)

6.4.2.4 Perceived need for dental care service

More than half of the participants agreed that they would go to a dentist if they had a severe problem with their teeth and mouth, with pain as a principal driver for dental attendance. The absence of pain was wrongly perceived by some of the participants as their not having any oral health problems. In addition to this, having tooth decay, loose teeth, swollen gums, sensitive teeth and missing teeth were among triggers which can make the urban older people consider seeking dental care.

'I have never had any pain, my teeth fell out by themselves, and there was no pain… I didn't feel any pain. I just leave it because I have lost lots of teeth. I am almost toothless now. Thus I have never checked my teeth to a dentist.' (SN 32, Female, 73 years)

'If we have tooth decay, even though it is just a little hole, it will be painful if we drink cold drinks or usual water. "Oh, what happened to my teeth?" Thus, it becomes a sign that I need to go to the dentist.' (SN 15, Female, 60 years)

'So because I am old, I am almost 70 years now, I will go straight away to a dentist if I have felt that I have loose teeth. The dentist in East Depok, but I forgot her name.' (SN 9, Female, 67 years)

'If I have swollen gums, that means serious teeth problems. If not, I won't go to the dentist yet.' (SN 1, Male, 76 years)

[2] *An Indonesian sweet toffee*

'Yes, I will go to the dentist when I have sensitive teeth and ask "Why my teeth feel so sensitive? What things should I do? What medicine you could recommend me?".' (SN 20, Male, 71 years)

'Yes, I automatically have problems with these poor teeth conditions. I want these tooth to come out, and then I will go to the dentist and ask him to make me dentures.' (SN 16, Male, 63 years)

Seven participants' stated that they have never been to a dentist. Participants' perception that they could handle their oral health problems, lack of proximity dental health service, availability of someone to accompany them to the health facilities, and worry and fear about dental care were among reasons why the participants did not go to a dentist to check their oral health conditions.

'My family said that I had swollen cheeks. I always said that saga and betel leaves are enough as a medicine for me. "Mom, I think you need to see a dentist." I said "No, I don't need to go to a dentist. I have never been to a dentist all my life". Because my mother had never been to a dentist as well. She died recently at 96 years old. She had a toothache, but she treated with 'menyirih' (chewing betel leaves), so she had no dental pain.' (SN 21, Female, 76 years)

'I didn't go because I was too lazy to walk there. Depok health centre is far from me.' (SN 3, Female, 66 years)

'I didn't go to the dentist. I just slept at home because I didn't have anyone to bring me to go to the dentist. My children live far away from me.' (SN 29, Female, 70 years)

'My teeth have been loose for a long time. Perhaps it has been three months now. I went to the health centre three times, but I was too afraid to get teeth extractions. I was horrified about the possible effects later on after tooth extractions, so I didn't want to do that. I will just leave it until they come out by themselves.' (SN 30, Female, 71 years)

6.4.2.5 Access to oral health care

There were various barriers to and facilitators supporting access to oral health services reported by the participants. Table. 6.2 presents the variables that affect the participants' accessing oral health care.

Table 6. 2 Facilitators and barriers to the participants accessing oral health services. Some of the issue raised by the participants can act as both facilitators and barriers depending on the context mentioned by the participants.

Access to oral health care	Facilitators (+)	Barriers (-)	Number of participants raised this issue
Proximity of dental service	✓	✓	20
Cost	✓	✓	15
Dentist's communication skills and attitude	✓	✓	13
Appointment system and time efficiency at the health facilities	✓	✓	13
Worry, fear, or traumatic experiences		✓	13
Satisfaction or dissatisfaction of the dental treatments	✓	✓	11
Health insurance	✓		10
Availability of someone to accompany to the health facility	✓	✓	9
Misleading information		✓	6
Trust	✓		4
Recommendation from other people	✓		4
Dentist's reputation	✓		4
Daily quota of dental patients per day		✓	4
Accessibility of dental services	✓		3
Clean and comfort	✓		3
Health facility's opening hours	✓	✓	3
Afraid of malpractice		✓	3
Multi-visit dental treatment		✓	3
Informative dentist	✓		2
Worry about instruments sterilisation		✓	2
Advanced dental equipment	✓		1

The proximity of dental health service was the most commonly suggested consideration for the participants in accessing a dentist or other dental care professionals. Many participants suggested that the proximity of dental health care services to their homes made accessing the service more straightforward. Conversely, some participants identified that the distance between their home and the closest dental services acted as a barrier to attendance.

> *'I have loose teeth for the past a year. I have a tooth which has been filled since 19 years ago. It is still in good condition, but the teeth besides this tooth are mobile, so I went to a dentist. Well, I didn't go to a private dentist. I went to the health centre because the health centre was near. The distance is close, and the cost is cheap. That is why I choose to go there.'* (SN 12, Female, 66 years)

> *'I didn't go because I was too lazy to walk there. Depok health centre is far from me.'* (SN 3, Female, 66 years)

Cost and affordability of the dental treatment were raised as a barrier to accessing care by the participants. Some of the participants reported that health insurance from the government was beneficial to cover the cost of basic dental treatment, such as dental filling and tooth extraction. The Indonesian government has introduced the National Health Card-Indonesia Health Insurance Program for its citizens since 2014. This health insurance program is organised by *Badan Penyelenggara Jaminan Sosial* (BPJS) (BPJS Kesehatan, 2020). However, the coverage of this health insurance is still in gradual progress. Thus, there is a possibility that some of these older people have not been registered to the BPJS. The availability of dental services covered by health insurance provided by the government was considered as a facilitator for participants to utilise dental health facilities.

On the other hand, others also described the expense of other dental treatments could be a significant barrier for them in accessing the treatments for their chronic oral problems, such as oral problems caused by their chronic periodontitis.

'It is expensive if we go to a private dentist. Thus, I use the one which is free and covered by government health insurance.' (SN 2, Female, 64 years)

'We have to think about the cost if we want to go to a private dentist. However, I can use BPJS, so I feel ease. The most important thing is we want to go to the health centre. If I have health problems, I can go to the health centre. It feels ease because we don't have to pay anything with KIS. All we have to do is to register and then the health professional will examine us.' (SN 25, Male, 60 years)

'I have retired. Information from social media urged me to take care of my teeth better. Before my retirement days, I used to think to take care of my teeth and clean my tartar, but the cost wasn't covered by the office. They only cover basic treatments. Thus I didn't do that because I knew the cost was so expensive.' (SN 8, Male, 63 years)

'The dentist suggested cleaning the tartar. I haven't cleaned my tartar up until now because it doesn't cover by the BPJS [health insurance provided by the government]. The dentist said, "It is better if we can clean the tartar before teeth extractions".That was because I have loose teeth. Yes, it has been suggested by the dentist, but I haven't had the money to pay the cost yet.' (SN 12, Female, 66 years)

Some of the participants who used government-funded dental services complained about the long waiting time at the health services before they could see the dentist and receive any treatment or medication. Indeed some participants preferred to go to private dental service to avoid these long waiting time. In addition to this, these participants also praised a better appointment system and time efficiency at private dental practices.

'I had a toothache and I had to wait for a long time. Even though I went there [government-funded health centre] early in the morning, the queue was already full of people.' (SN 18, Male, 73 years)

'My problem with the government health centre was about queuing time. I disliked the long waiting time. Thus, I prefer to go to a private dentist when I have money.' (SN 18, Male, 73 years)

'The waiting time. Normally people need to wait for quite a long time. For example, BPJS (health insurance from the government), people said, "Ah, don't use it because it takes a long waiting time". I thought, of course, it takes time because it offers cheaper health service cost and there are lots of people who want to use the BPJS. That is the problem (of using government-funded health services).' (SN 19, Male, 75 years)

'There were not many patients at the private clinic, so they could give good service and also a short waiting time. We can phone them and ask if the dentist had arrived, then I went to the clinic. Thus, I have good experience with the clinic.' (SN 12, Female, 66 years)

Dentist and health professionals' communication skills and attitude was an important issue raised by the participants as one of the considerations for accessing dental health services. Many participants expected a patient-friendly, thoughtful, and polite dentist and health staff at the dental services. The participants perceived these attributes as a reason for them to come back to dental practice when they had oral health problems.

'Dentist and the dental nurse must be able to provide the best services, especially with a gentle and friendly attitude to faced elderly patients. That will be helpful for the elderly, so the patient won't feel tense like I did. Friendly services make patients happy. Thus, it can reduce any worry to go to a dentist because elderly patients are different from younger patients. That is what I feel necessary for dental services.' (SN 10, Female, 68 years)

'If a dentist can talk politely about our dental problems…I feel this kind of attitude could make the patient's pain less painful. Thus, the dentist needs to be friendly. If the dentist is rude, then the patient's pain will feel worse.' (SN 11, Female, 65 years)

'A good services. That is all. Friendly. I felt automatically my problems got better after received good and friendly services. That is also a form of treatment. So, I hope dentists are not rude to the patients.' (SN 16, Male, 63 years)

Being worried about or fear of dental care was also described by some participants as a barrier for them in accessing dental services. Despite these concerns, some participants reported that they still went to see their dentist to overcome their oral problems. On the other hands, some participants decided not to get treatment from a dentist even though they had experienced chronic oral issues.

'I always afraid to go to dental services. I don't know why I am so scared, but the dental instruments are just horrifying. However, I will come if I need to. Once I came for tooth extraction. Although I had received an anaesthetic injection to numb the teeth, I was still terrified. I didn't feel anything when the dentist performed the extractions. Maybe I was just scared about the injection.' (SN 10, Female, 68 years)

'Sometimes I think "Do I need to have dental treatment?" But, I am too afraid of dentists. I am so scared of their instruments. Just scared.' (SN 23, Female, 65 years)

'I have had this problem for quite sometimes now. I think my teeth have been loose for the past three months. I want to get it extracted, but I am too scared. I am afraid there will be side effects after the extractions. Thus, I don't want to do it. I will wait until my teeth fall out by themselves. (SN 30, female, 71 years)

Satisfaction and dissatisfaction of prior dental treatment affected participants' decision to access dental health services later in life.

'I swear I will not get my teeth extracted at that place again. The dentist was like that. Not gentle and performed the treatment rudely. She didn't talk to me. Thus, I think the service was not good.' (SN 2, Female, 64 years)

'The dentist was so memorable. I went there repeatedly to clean my tartar. Clean my tartar and plaque. I also had dental fillings there. I went there several times. The dentist was so lovely, perhaps because he was quite old himself. The treatment was excellent as well. ' (SN 12, Female, 66 years)

Participants underlined the importance of having someone to accompany them to the health practice. Some participants suggested that they felt more comfortable if they had children or a spouse to go with them to the health facility. A small number of participants felt discouraged to go to the health facility if they don't have anyone to accompany them.

'I didn't go to the dentist. I just slept at home because I didn't have anyone to bring me to go to a dentist. My children live far away from me.' (SN 29, Female, 70 years)

'I am accepting my condition. Why do I feel like this? Because I have realised that I am old now and I need someone to accompany me everywhere. My children have children as well. Thus, sometimes if I ask my children to bring me to the health facility, they said "Tomorrow, I'll bring you to the health facility. I don't have time just now." Oh yes, I understand that my children have lots of things to do, his wife and children also need his time.' (SN 23, Female, 65 years)

Misleading information was one of the factors which can be a barrier for the participants accessing treatment from a dentist. Participants could receive misleading negative information from their family or friends. This information had an impact on how they perceived dental treatments could be harmful to their well-being.

'I feel scared if a dentist does a forced extraction. I am afraid the extractions are harmful to my nerves. I have heard people's stories, tooth extraction can affect your eyes. I also heard by myself that there were many incidents caused by pulling out teeth, such as people passed away

after getting a tooth extraction. This information scared me.' (SN 16, Male, 63 years)

'I have a niece. She said "Don't ever go to a dentist. I have experienced with tooth extractions that made me screamed". Thus, I feel afraid to go to a dentist. I don't want to. I better follow what my mother told me, chewing betel and saga leaves. I always remember what my niece said "My tooth was extracted until I cried and screamed because it was too painful. Don't go to the dentist. Don't go". After hearing her experiences, I will never go to a dentist for the rest of my life. I will just chew the leaves for three days if I have a toothache. If after three days, I still have a toothache, then I will eat more leaves as my medicine.' (SN 21, Female, 76 years)

Besides the considerations discussed above, participants also reported other factors, including trust, recommendations from other people, dentist's reputation, daily quota of dental patients per day at a government-funded health centre, accessibility of dental services, clean and comfort, health facility's opening hours, malpractice, multi-visit dental treatment, informative dentist, instruments sterilisation, and advanced dental equipment. These considerations affect participants' preference for utilising dental health service for oral health maintenance and treatments purposes. Appendix 6.10 elucidates quotations regarding other considerations in dental services utilisation reported by the participants.

6.4.2.6 Influence or advice from family/ friends/ colleague to overcome oral health problems

Family, friends, and colleague play an important role as the first source of information in daily life. These people also have a strong influence on the way participants' react to their oral health problems by offering solutions and advice. There were several forms of influence from family, friends, and colleague reported by the participants, including suggestions for oral health

maintenance, advice to overcome oral health problems, and recommendations regarding a good dentist or oral health facilities.

Family and friends were often mentioned as participants' first source of information about oral health maintenance. In addition to this, family members might give a daily example of how to maintain oral health and dietary habits. Moreover, talking with family and friends gave an opportunity for some participants to share their oral health problems in the past in a casual daily conversation.

Participants received various sorts of advice to help them to overcome dental problems. This advice includes self-care at home, non-prescription medicine, suggestions to go to a dentist, and suggestions to get particular dental treatments from a dentist.

> *'My neighbour suggested rinsing with salt. She said, "You can try gargling with salt water". I said "Ok, I'll do it. I hope it will cure my toothache".* (SN 2, Female, 64 years)

> *'My wife said, "Your mouth is smelly, don't forget to chew the chewing gum". She always provided me with chewing gum. Before I went here, she also reminded me to take the gum from the cupboard.'* (SN 7, Male, 77 years)

> *'Yes, I normally use painkiller to overcome dental pain. Usually, we will be given painkiller if we go to general practice and these painkillers also can be bought at many stores, such as Panadol, Oskadon, and Ponstan. My children who have dental problems also have medicine stock at home. Usually, she offers me as well "Here, Dad. This medicine is good for a toothache.". '* (SN 8, Male, 63 years)

> *'My children at home have encouraged me. "Mum, you should see a dentist. Thus, your teeth can be extracted if it is necessary. If it is possible, you can also get your teeth filled by the dentist.'* (SN 22, Female, 65 years)

'Yes, if you need to use dentures, then it will make you more comfortable to eat. Please do the dental treatment for the remaining teeth as well. Those were the advice from my friend.' (SN 12, Female, 66 years)

6.4.2.7 Harmful habits to oral health

Participants described several habits that they felt might affect their oral health. Figure 6.3 presents the various habits reported by the participants. However, this section only focuses on harmful practices, which may have an impact on participants' periodontal condition. Some of the participants might not be aware that their habit could affect their periodontal disease progression. These habits mentioned by the participants include mechanical and chemical irritation, which can be harmful to their periodontal tissue.

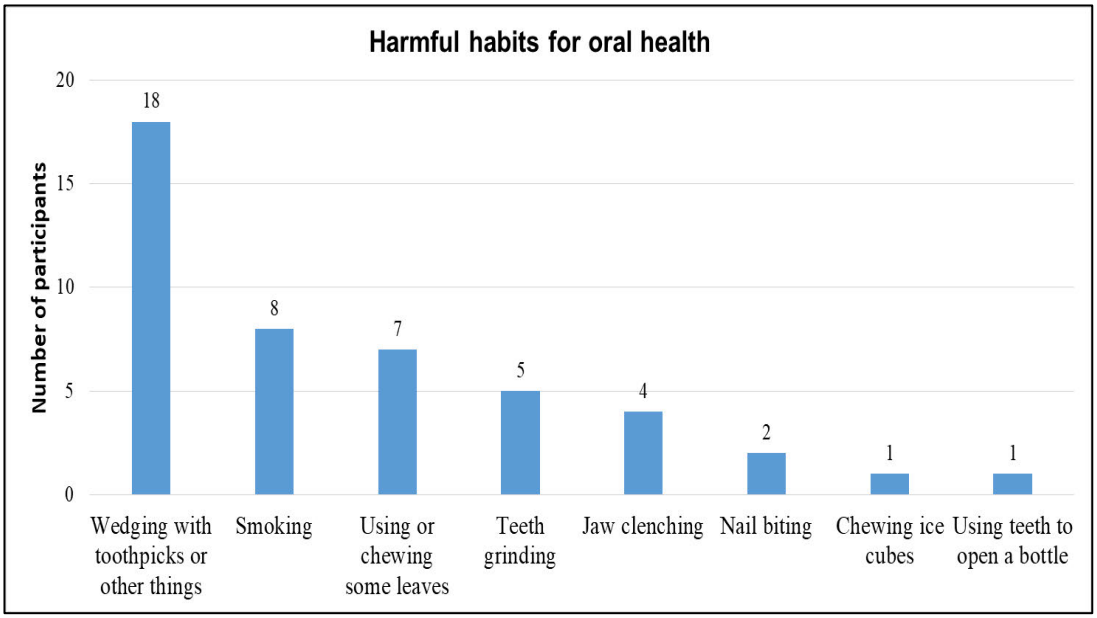

Figure 6. 3 Various harmful habits introduced by the participants.

Many participants mentioned that they needed to clean food impacted between their teeth after eating by wedging with toothpicks or other things. This repetitive practice with uncontrolled force to gingiva may introduce mechanical trauma.

'Well, I always use this (straws) after every meal. The straw is softer to wedge the food. I will split the toothpicks if I am going to use it, so it becomes thinner. ' (SN 8, Male, 63 years)

'The problem is I couldn't remove the foods without toothpicks. It couldn't be cleaned by the toothbrush, even though I brushed as forceful as I could because the foods were just stuck there.' (SN 16, Male, 63 years)

Some participants acknowledged that smoking has a negative effect on their health, including oral health. Smoking was perceived by the participants to have a relation to several oral health problems, such as bad breath, poor appearance, and staining. Although these participants realised the negative effect of smoking on their health, some of them have reported their difficulty to stop smoking completely.

'People who smoke have yellow teeth. Perhaps you have known about this as well. Yes, that is caused by smoking.' (SN 1, Male, 76 years)

'The smells were attached. It smells so bad. I used to smoke, so I have known this. If we are near someone who smokes too much, then we can smell their bad breath.' (SN 8, Male, 63 years)

'I think what we eat and drinks may affect our teeth. My teeth are brittle because I am a smoker. Moreover, I also drink coffee. I started smoking and drinking coffee when I was in high school because of my friends' influence. I couldn't stop up until now. I can reduce the number of cigarettes I smoke, but I couldn't stop smoking.' (SN 16, Male, 63 years)

'Cigarette left nicotine trace. Nicotine is from the filter at the end of the cigarette. I tried to clean it from my teeth, but it was hard to clean if the nicotine has become tartar.' (SN 26, Male, 65 years)

Participants reported some self-inflicted habits, such as nail-biting, teeth grinding, and jaw clenching. These habits may potentially injured teeth and periodontium, such as tooth attrition, gingival recession, increased tooth

mobility, and sore jaw muscles. Some of these participants might not entirely realise the impact of the bad habits to their oral health and the risk of progression of their periodontitis.

> *'The sounds was kretek kretek kretek like the sounds of mouse scratching. I couldn't do that anymore now because I have lost some of my teeth. I think teeth grinding cause my enamel wore out or disappeared. Thus, I feel my teeth are sensitive.'* (SN 16, Male, 63 years)

> *'I know that we shouldn't do nail-biting because it is dirty, isn't it? But I like it when I use my mouth like this (showed some nail-biting gesture). I like to bite my nails. I think it is like a hobby for me. I do that if I feel bored. Just for fun. However, I didn't do that when I was younger.'* (SN 26, Male, 65 years)

Some participants used traditional chewing habits to maintain and treat their oral health problems. This chewing habits usually used particular leaves or flowers, such as *Jatropha Curcas leaves, Abrus precatorius leaves, Betel leaves*, and *Plumeria* flowers. Chewing habits are a part of normal sociocultural interactions for Indonesians, especially among the older generations. The chewing tradition was believed by the participants to be a strategy they could use to overcome oral health problems. On the other hand, participants also reported they perceived adverse effects of this traditional chewing habits. For example, teeth have become brittle, rotten, and fell out through the time.

> *'I didn't go to a dentist when I had a toothache. I usually chew betel and saga leave three times a day, and then I will get better. I have never felt great pain. Thus I have never go to a dentist. All my life, I have never been to a dentist.'* (SN 21, Female, 76 years)

> *'I put the sap of Jatropha leaves in the cotton and put it in the tooth with a problem. Some people told me to do that. I found it true, and the pain was gone. Previously, I was back and forth to the dentist. I thought this sap worked for my toothache. However, my teeth have become brittle*

and turn into pieces as the side effects of those sap. Thus, I have difficulty in chewing any food now.' (SN 5, Female, 80 years)

In addition to the harmful habits mentioned above, one participant also reported his oral habits from when he was young. He used to chew ice cubes and using teeth to open a bottle. These habits may cause damage to the teeth and periodontal tissue. This participant also acknowledged the negatives effect of his practices in the past to his current oral health condition.

'I used to chew ice cubes quite often, so my teeth are damaged like this. I used to do that often.' (SN 26, Male, 65 years)

'Yes, I used to use my teeth to open a bottle because I was working as a sailor on the boat. I can still feel the bad effect of my habits now. Now, my teeth feel sensitive, and I feel pain if my teeth touch anything cold.' (SN 26, Male, 65 years)

6.4.2.8 Traumatic experiences which affect participants' behaviour toward oral health

Traumatic experiences related to oral health may affect participants' attitude toward their future dental attendance and dental treatments. There were two types of the traumatic event that the participants recalled, those experienced by themselves and those recounted by others.

Participants who had bad experiences with dental treatments suggested that they did not want to go back to the same dentist and prefer to go to another dentist.

'I don't want to get tooth extractions in that place ever again. I said it. I almost fainted when the dentist did the extraction. I said to my husband that I don't want to go to that place again.' (SN 2, Female, 64 years)

'My teeth…the toothache disappeared after I had medication. For example, I went to the dentist on Thursday or Wednesday or other days,

and I felt better after a week. However, the pain came back again. Ouch, it felt like my head would explode. Then the dentist told me that was because the infection reached my nerves. Finally, I said to him "I give up, now what you can do to fix this?" I came to the dentist, not only one or two times. I went to the dentist almost once a week for three months, just multiply how many my dental visits were? That was true I didn't pay for the treatments, but I wasn't playing with the toothache. I said, "So, what are the solutions you can offer?" He said, "Tooth extraction, this is the only way.".' (SN 28, Male, 71 years)

'My first dental treatments experiences (refer to his difficult time mentioned above) left me traumatised, no more.' (SN 28, Male, 71 years)

One participant admitted that his own behaviour leads to his traumatic experiences with dental treatment. He lied to the dentist about what he felt because he wanted to get his dental problems done as quickly as possible.

'That was the only one. I had redness until my cheeks. The pain was terrible after I had tooth extractions. It was swollen here (pointing out his cheeks). I had swelling around my tooth, and my gums were red. That was the only one. After that, I never did the same thing again because I was too afraid. If you still have a toothache, do not ask for your teeth to be pulled out by a dentist. After the pain was gone, then you can have a tooth extraction. In my case, I couldn't stand, so I wanted tooth extraction. But after that, it was red and swollen tremendously.' (SN 27, Male, 68 years)

'I lied to the dentist. The dentist said, "Do you feel any pain?" I said, "No, no pain". Then the dentist pulled out my tooth with forced. "Was it painful? I answered "No". I just wanted my tooth pulled out because it had caused me pain for a long time. Finally, I had my tooth extracted, but after that, the pain was terrible, and my cheek was swollen. The gums were red and felt salty. It was really disturbing me.' (SN 27, Male, 68 years)

6.4.2.9 Retrospectives regret related to oral health problems

Retrospectives regret expressed by the participants and linked to their past lack of knowledge about how to maintain oral health, past behaviour, ignorance of oral health maintenance in the past, and failure to take action to overcome oral health problems in the past.

> *I am taking care of my teeth now. I don't want any decay to my remaining teeth. I wish I had done it when I was young, and perhaps my teeth would be good enough nowadays. Maybe because I didn't know how to maintain my teeth in the past. Even for a toothbrush, we didn't replace the toothbrush at least four times a year, but we used it until the toothbrush worn out and damaged, then we would change the toothbrush. Moreover, the quality of the toothbrush was not good because I used to live in the village. I regret it now. That is why I always encourage my family to take care of their teeth, especially my children*.' (SN 15, Female, 60 years)

> '*My gums feel painful. Thus, I have tried to reduce drinking tea. I also don't drink coffee nowadays. I still drink tea, but I have tried to reduce it. I want to stop drinking tea as well. Thus I will only drink water. Perhaps I was wrong in maintaining my teeth from a long time before I get married because I didn't have knowledge about it. Then after I have married, I often drink a coffee to accompany my husband, and also tea. Now, I have experienced the effect of my habits*.' (SN 23, Female, 65 years)

> '*Sometimes, I forget to brush my teeth. Well, my teeth conditions have been bad like this. I am frustrated because of that. I want to take care of my teeth, but I am too frustrated with my teeth conditions. I used to take care of my teeth when I was young, especially when I was single. However, I have been lazy to maintain my oral health after I have a wife and children*.' (SN 16, Male, 63 years)

> '*It is like what I told you before (refer to his past problem about having bad breath), I went to ENT surgeon, I didn't know that my problems came*

from my teeth. Apparently, it was my teeth cavities, which caused the problems. Started from there, I have known that I have lots of decay teeth, and many of them have come out now. My teeth conditions could be better from what it is now if I was more responsive to seek treatments for my teeth problems and maintain my teeth better.' (SN 8, Male, 63 years)

6.5 Discussion and implications

Our study findings were in accordance with the Wilson and Cleary model, which underlined the importance of individual and environmental factors in the relationship between disease and overall quality of life (Wilson and Cleary, 1995). To summarise the identified data findings, the Wilson and Cleary model had been populated with some additional details as modifications. The original Wilson and Cleary health-related quality of life conceptual model (this original model can also be found in Chapter 2. Literature review), and the Wilson and Cleary model which had been populated with the findings of this study are summarised in Figure 6.4.

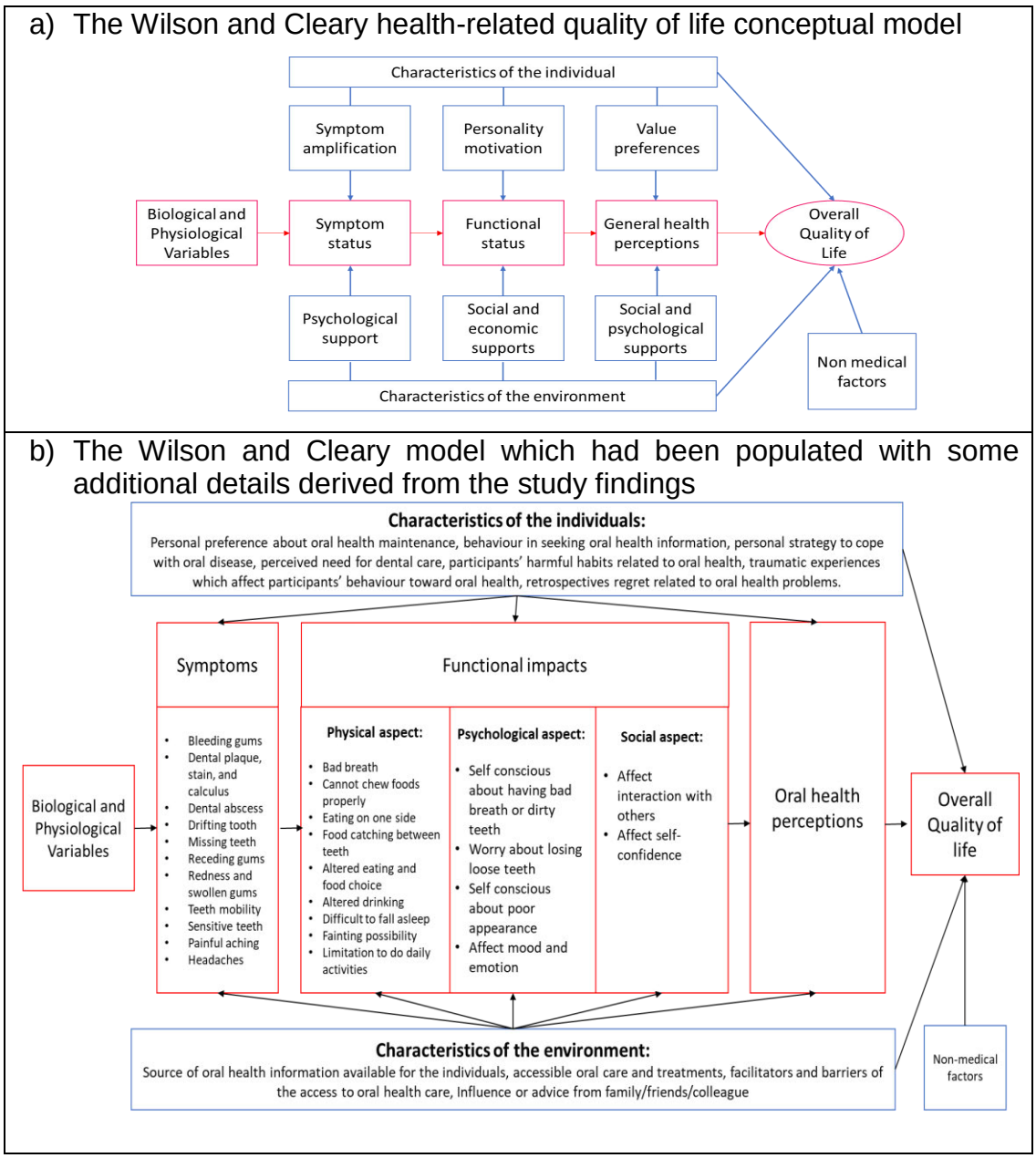

Figure 6. 4 a) Original model of the Wilson and Cleary conceptual model (Wilson and Cleary, 1995), b)Summary findings of this study in the Wilson and Cleary model with additional details as modifications. The interactions between the impacts of the periodontal disease, individuals' characteristics, and environmental characteristics might affect participants' overall subjective quality of life.

Most of the data related to the periodontal impact on the quality of life aspects in this study are in accordance with Locker's model. The impacts on the quality of life were not limited to those caused by periodontal disease, but also to those associated with other oral health problems reported by the participants. There were four components of Locker's model found in the analysis of these data,

which are impairments, pain and discomfort, functional limitations, and disability. However, the fifth element of the Locker model, a handicap was not mentioned by the participants. The handicap was defined as a state of not being able to function in this study. This finding can be understood as a handicap can only be caused by a very high impact on someone's lives and whilst individuals may be handicapped by tooth loss they may not relate this specifically to periodontal disease. Locker's model can be found in Chapter 2. Literature review section 2.2.2.

Our findings highlighted that impairments might cause a restriction in the body functions, discomfort, and pain. Then these restrictions, discomfort, and pain may progress to disability in physical, psychological, and social life.

Clinical signs resulting in perceived impairments were often identified as the earliest sign that periodontal disease impacts the quality of life among participants in this study. Most of the participants mentioned that they had experienced at least one of the impairments related to the periodontal disease described in section ***6.4.1.1***. Tooth mobility, sensitive teeth, and missing teeth were the most reported impairments.

Locker's original model suggests that the components of the model above are sequentially related. However, our data indicate that participants' beliefs and expectations might strongly influence the linear direction described by the Locker's model. Although missing teeth in older people are commonly associated with the advanced progress of oral health diseases, such as caries and periodontal disease, this permanently functional limitation was not always perceived as discomfort, disability, or handicap by the participants. The progression of tooth mobility leading to tooth loss was widely accepted by many of the participants as an inevitable part of the ageing process. Thus, increasing tooth mobility as a sign associated with a progression of periodontal disease was neglected. This misleading perception might be a potential explanation of the passive reaction of some of these urban older people toward their periodontal disease-related problems. This implication is supported by an observation that some of the participants mentioned that they had realised they

had loose teeth over quite some time before they went to the dentist. Some of them also indicated their passive reaction to their loose teeth as they would rather wait until the teeth fell out on their own rather than seeking dental care.

Besides tooth mobility and tooth loss, other impairments likely related to periodontal disease were also neglected due to misleading perceptions and lack of dental health awareness. For instance, although gingival bleeding might be one of early signs of chronic periodontitis noticed by the participants, this early sign of periodontitis was not taken seriously by some of the participants. Gum bleeding was commonly accepted by the participants, especially if it happened while brushing. Some of the participants also showed a lack of oral health awareness as they would prefer to leave their dental plaque, stain, and calculus untreated.

The perception that periodontal disease is an inevitable part of the ageing process and could not be prevented might prevent these older people from seeking periodontal treatment for their periodontal problems in the early stage of the disease. Moreover, the lack of oral health awareness might worsen this condition. While in fact, treating their periodontal disease may prevent disease progression and increase their chance to retain their natural teeth in a healthy functional state.

Pain is the most common trigger reported by these participants leading them to search for care and treatments to overcome their dental problems. The absence of pain was perceived by some of the participants as their not having any oral health problems.

Participants described various sorts of pain and physical discomfort, which might be related to their periodontal disease. The pain was reported by participants' as raising their concern about their oral health condition and motivated them to search for care and treatment. Various types of pain were mentioned by the participants including painful aching, constant pain associated with a dental abscess, extreme tooth sensitivity, pain related to redness and swollen gums, and pain related to tooth mobility. These

extensions of periodontal disease were acknowledged by the participants and resulted in limitations of their oral health function and restriction to their daily activities. Restrictions in physical activities reported by the participants included an inability to work, eat or speak, unwillingness to get up from bed, and avoiding doing household chores. These physical activities restrictions can be considered as disabilities caused by chronic periodontal disease.

Most of the participants mentioned that they would consider going to the dentist when they had unbearable pain and self-care did not seems to work to relieve the pain. We also found that seven of our 31 participants reported that they had never been to a dentist. On the other hand, most of the participants stated that they would go to the dentist when they had a severe toothache. Only two of the participants reported they had a routine dental check-up at least once a year.

The extent of chronic periodontal disease had also brought psychological discomfort, psychological disability, and social disability for the participants. Psychological discomfort and disability, such as being self-conscious about having bad breath or dirty teeth, worry about losing loose teeth, poor appearance and emotional feelings have changed their social interactions and negatively affected their self-confidence. The realisation by an individual of having bad breath or dirty teeth led to a restriction in participants' daily socialisation. We can also highlight that periodontal disease had changed the way these older people behaved in social interactions. Some of the participants briefly mentioned their habits of selectively concealing their mouths in their daily interactions. These strategies include covering the mouth while talking, keeping a distance from people while talking, covering mouth when smiling or laughing, and a reluctance to smile. Feeling insecure about having bad breath or poor appearance of their teeth and gums might limit their willingness to engage in casual social interactions and sap their self-confidence. These findings are in accordance with a previous qualitative study which reported that psychological discomfort and disability related to periodontal disease might affect social interactions and self-esteem (O' Dowd et al., 2010).

Our findings related to signs and symptoms of periodontal disease to their impact on the quality of life for this study population. The outcomes were focussed within six of the domains of OHIP; functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, and social disability. However, we did not find any themes related to handicap, which is the seventh OHIP's domain.

Our data demonstrated both a low awareness of periodontal disease and a widespread and misleading belief that the oral problems related to periodontal disease were an inevitable part of ageing in this study population. In addition to this, there were inevitably certain individual and environmental factors that would personalise participants' periodontal disease experiences.

Our data identified several individual factors that may modify participants' periodontal disease experiences and their role in modifying quality of life. These individual factors include personal preference for oral health maintenance, behaviour in seeking oral health information, personal strategies to cope with oral health problems, perceived need for dental care, individual's harmful oral health habits, prior traumatic experiences which affect participants' behaviour toward oral health, and retrospective regret due to oral health problems in the past. In addition to this, we also identified some environmental factors that might modify participants' periodontal disease experiences; sources of oral health information available, accessible oral health care and treatment, facilitators and barriers to accessing oral health service, social and psychological support to overcome oral health problems.

The overall outcome of periodontal disease on the subjective measure of quality of life should be an integration of the detrimental feelings associated with the signs and symptoms of periodontal disease alongside the individual and environmental characteristics. This integral relationship between disease status, characteristics of the individual and environmental on the quality of life has been explored in the existing models of health-related quality of life (Bergner, 1985, Read et al., 1987, Patrick and Chiang, 2000, World Health,

2002, Wilson and Cleary, 1995). The details of these models of health status and health-related quality of life can be found in Chapter 2. Literature Review.

Furthermore, previous qualitative studies which tried to explore the relationship between oral health disease and quality of life also highlighted the role of an individual and environmental characteristics. A recent qualitative study conducted in England highlighted that dry mouth had affected people's daily life negatively. This study interviewed 17 participants with dry mouth, from a variety of causes on quality of life. This study highlighted that the impact of dry mouth was modified by psychological, social, and environmental factors (Gibson et al., 2019).

There are very few prior qualitative studies concerning patients' experiences of periodontal disease and the influence of environmental factors on participants' perceptions toward their disease and quality of life. O'Dowd identified stigma of the periodontal disease as one of the environmental factors which may affect patients' periodontal disease experiences. The stigma was related to perceptions that people who had the periodontal disease were "unclean" or "unhygienic". This stigma from other people affected the way participants see their disease and their self-confidence (O' Dowd et al., 2010).

The reported impacts of periodontal disease and how participants' in this study react to their oral health problems related to periodontal disease demonstrated the importance of future action from public health practitioners and dental health clinicians in Indonesia to promote periodontal disease awareness, more specifically to older people. This health promotion may help to correct the incorrect assumptions and widely accepted beliefs in the society that some periodontal disease-related conditions (such as tooth mobility, receding gums, and tooth loss) are normal and a part of the inevitable ageing process. Thus, it would be expected that older people would become more aware of maintaining their teeth and periodontal health to retain normal function. Furthermore, the natural teeth will last longer in the mouth. Previous studies have suggested that the presence of natural teeth is significant for mastication and nutritional purposes which may affect older people's quality of life (Gilbert

et al., 2004, Gil-Montoya et al., 2013). People need to have at least 20 teeth properly distributed to chew effectively. More specifically, we need a minimum of five occluding pairs of posterior teeth to have optimal chewing effectiveness (Käyser et al., 1990). Previous studies have also suggested that periodontal health has been linked with a better quality of life (Palma et al., 2013, Brauchle et al., 2013, Bernabé and Marcenes, 2010, Cohen-Carneiro et al., 2010, Jowett et al., 2009). Even further, maintaining normal function and retaining natural teeth longer in the mouth may help people to have a better life expectancy (Friedman and Lamster, 2016).

Access to dental care also brought complex issues as it depends on both of individuals and environmental predictors. These individuals and environmental characteristics had two dimensions which could be facilitators or barriers in accessing oral health services. Our data suggested that there was a lack of access to oral health care services which affected by various factors, including the availability of health facilities close to the community and accessible public transportation in the area. Based on the National Health Survey 2018, there was only 32.3 per cent of people living in West Java province who perceived that the access to health care services was easy, while 67.7 reported that the access to the health facilities was difficult (38.2%) and very difficult (29.5%) (Badan Penelitian dan Pengembangan Kesehatan, 2019).

In addition to this, the cost of dental care services had been an important barrier for these urban older people to get dental treatments. Although many of these participants reported that they have National Health Card-Indonesia Health Insurance (BPJS insurance), some of them did not seem aware of the available primary oral health treatment and services that are covered by their insurance. While in fact, knowing the availability of the basic oral health services will help these participants to overcome the significant barrier to access oral health care related to the cost of the treatments.

These findings were also reflected in the Indonesia National Health Survey 2018, which reported 75.6 per cent of Indonesian did not go to the health professionals when they had oral health problems (Badan Penelitian dan Pengembangan Kesehatan, 2019). Thus, it is crucial for the Indonesian

government to promote and socialise the health services and treatment available and can be accessed by the BPJS health insurance holders.

Furthermore, participants also reported lack of dental information given by the dental professionals. These participants highlighted insufficient information and time given by the dental professionals to explain their oral health disease, availability of the options that can be taken to overcome oral health problems, and information to improve and maintain oral health.

Based on the findings described above, our data highlighted the important of improving accessibility of dental care, socialisation of the basic oral health treatment covered by the BPJS insurance, and dental health professional willingness and ability to provide oral health information as crucial factors to minimise the barriers to access dental services. It is hoped that eliminating the barriers factors will influence older people to be pro-active to check their dental health and get dental treatments at the initial phase of periodontal disease.

6.6 Strengths and limitations of the study

As a limitation to this study, the context-specific nature of this qualitative study which used urban older people as participants may limit the generalisability of the findings. Thus, it would be interesting to ascertain whether these outcomes would be observed in both urban and rural older people in Indonesian or in the Indonesians general adults population. Furthermore, it would be fascinating to compare participants' periodontal disease experiences in this study with those from different countries.

In addition to this, it is important to underline that these findings related to impacts on the quality of life were not necessarily limited to those caused by periodontal disease but reflect the combination problems in the subjects' mouths caused by both periodontal disease and other oral health problems. Nevertheless, this study had attempted to separate the impacts likely related to periodontal disease and the impacts likely related to other oral health problems. Moreover, the presented analysis and quotations focused on the reported impacts likely related to periodontal disease.

As the strengths of this study, to our knowledge, this study is the first qualitative study which focuses on the oral health-related quality of life of the older people with generalised periodontitis in Indonesia. Both thematic coders who have a background as a dental professional can also be considered as the strength of the study as they are able to understand and identified oral problems which likely related to periodontal disease from the participants' interview transcriptions.

Selection bias had been minimised by including urban older participants with a range of BPE scores associated with generalised periodontitis, varying educational background, a range of ages and appropriate gender representation. This purposeful sampling approach increased the depth and richness of the data collected related to periodontal disease experiences and the quality of life in this study population.

6.7 Conclusions

It is fundamental to understand older people's perceptions of their periodontal disease and identify the norms and belief related to the disease. This study provides an insight into how urban older in Indonesia perceive the impacts of periodontal disease on their daily life. Participants in this study reported the negative impacts likely related to their periodontal disease. The qualitative approach used in this study gave a deeper understanding of the significance of periodontal disease in older people beyond pain, physical discomfort, and restrictions of the physical functions. Nevertheless, this study also underlined further impacts of periodontal disease perceived and experienced by older people. Periodontal disease has affected their psychological and social aspects of daily living. In addition to this, individuals and environmental characteristics of the participants might also modify and personalise these older people's periodontal disease experiences and their subjective appraisal toward the quality of life.

Furthermore, it was interesting that this study also identified misleading beliefs that problems related to periodontal disease were a normal part of ageing might influence participants' expectations and their subjective appraisal toward their periodontal disease and well-being. A widespread belief that the progression of tooth mobility to tooth loss as an inevitable part of the ageing process was apparent in these data. Besides tooth mobility as one of the signs of periodontal disease, some participants also indicated a lack of oral health awareness as they would prefer to leave their gums bleeding, dental plaque, stain, and calculus untreated. Thus, problems associated with periodontal disease were often neglected. On the other hand, this study also identified positive oral health awareness showed by some participants with higher educational background, such as doing routine dental check-ups.

This study also underlined the importance of understanding older people's individuals and environmental characteristics which could have two dimensions as facilitators and barriers in accessing dental treatments. These characteristics of the participants might also personalise their periodontal disease experience and their subjective appraisal of their quality of life.

Chapter 7 Mixed-methods data integration: The impacts of periodontal disease on oral health-related quality of life of the urban older population in Indonesia

7.1 Aims

This chapter aims to provide comprehensive findings of a mixed-methods approach of the impacts of periodontal disease on oral health-related quality of life of the urban older population in Indonesia through the quantitative and qualitative data findings.

The quantitative aspect of the study sought to investigate the relationship between oral health-related quality of life (OHRQoL) and periodontal diseases in the ageing population in Indonesia. Periodontal disease, together with other oral health conditions, were evaluated through its impacts on participants' subjective assessment of their OHRQoL. The short form of the Oral Health Impact Profile (OHIP-14) questionnaire was used as the instrument to record OHRQoL.

The qualitative aspect explored personal periodontal disease experiences of the urban older people and their OHRQoL through a detailed analysis of individual interviews with participants who all had generalised periodontitis. More detailed information about the quantitative and qualitative studies can be found in Chapter 5 and 6, respectively.

This chapter will emphasise the rationale for a mixed-methods approach to be used for this study, mixed-methods design, results from the integration of these data and discussion.

7.2 Mixed-methods design

This study follows the recommended practice regarding the Good Reporting of a Mixed Methods Study (GRAMMS) (O'Cathain et al., 2008):

1. The purpose and justification for using a mixed-methods approach are described in section 7.1 and 7.2.1 of this chapter.
2. The design in terms of the priority and sequence of methods is presented in section 7.2.2 and 7.2.3 of this chapter.
3. Participant recruitment and sampling design, and data analysis are given in the details in Chapter 3. Research methodology, section 3.4 and 3.6.
4. Description of the occurrence of the data integration is presented in section 7.2.4 of this chapter.
5. The insight gained from the data integration is presented in section 7.3 of this chapter.
6. Limitation and strength of the mixed-methods data integration is described in section 7.4 of this chapter.

7.2.1 The rationale for a mixed-methods approach

Two recent systematic reviews of quantitative studies have underlined the negative impact of periodontal disease on quality of life (Buset et al., 2016a, Ferreira et al., 2017a). However, very few qualitative studies have been done to understand personal periodontal disease experiences and the extent of the effect of this disease to people's quality of life, especially in the context of the developing countries.

A mixed-methods approach seemed the best fit to acquire an in-depth insight into the complex issue regarding the impacts of periodontal disease on older people's OHRQoL. This study combines data from both quantitative and qualitative research through clinical examinations, an OHQoL questionnaire and semi-structured interviews. The rationale for using the specific combination of research instruments is to maximise the complementary

strengths of these multiple methods and to obtain both depth and richness of the data in relation to OHRQoL and periodontal disease experiences in this study population. Therefore, the mixed-methods approach may help to fill gaps in limited knowledge in understanding of the impact of periodontal disease on quality of life focusing on the older people population. The qualitative study provides a deeper probing from the quantitative research findings and an understanding of the complex issue of periodontal disease in old age. The integration of both quantitative and qualitative data allows us to understand the impact of periodontal disease more roundly by examining the similarities and differences between the quantitative and qualitative findings. More details background of the research methodology has been given in Chapter 3.

7.2.2 Implementation sequence

This study used a sequential explanatory strategy, with a quantitative data collection phase (oral health examinations and questionnaire completion) followed by a qualitative data collection phase (semi-structured interviews). The qualitative approach was used to explain and expand the quantitative findings. This approach was utilised to contextualise the quantitative results regarding the relationship between periodontal disease and OHRQoL by exploring participants' periodontal disease experiences and the impact of the disease on their well-being, and understanding participants' perceptions, value, and behaviour in relation with their periodontal disease. Figure 7.1 illustrates the sequential explanatory design of this study.

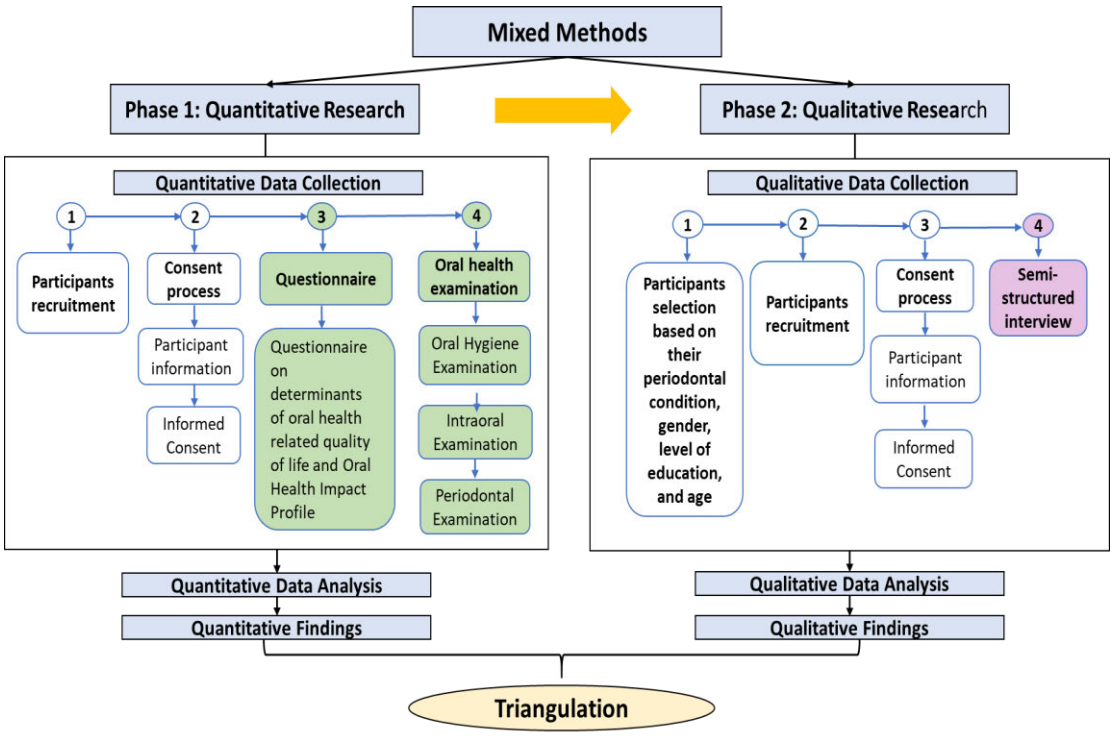

Figure 7.1 A Sequential explanatory design strategy of this mixed-methods study. The quantitative data collection was done prior to the qualitative data collection.

7.2.3 Priority

Priority refers to the relative weight assigned to the quantitative and qualitative components (Kroll et al., 2005). Although the quantitative data collection was done prior to the qualitative data collection, the priority of both sets of data was equal in this integrated analysis.

7.2.4 Integration

The integration of this mixed-methods study started with the selection method for the participants, where the outcomes from the quantitative data collection were used to determine the eligibility for the qualitative interviews. The details regarding the participant recruitment and sampling design for both quantitative and qualitative data collection are presented in Chapter 3. Furthermore, the

essence of the integration of quantitative and qualitative findings occurred in the interpretation phase of the data integration which presented in this chapter.

Triangulation data proposed by the Erzberger and Kelle was used to combine and draw inferences of different data from the quantitative (Chapter 5) and qualitative (Chapter 6) studies. Triangulation is an integrative approach to drawing conclusions from a mixed-methods data, particularly where the quantitative and qualitative components have equal weight. This approach describes the logical correlations in mixed-methods research to combine the findings and to improve understanding of the issue being studied (Östlund et al., 2011).

In a mixed-methods study where qualitative and quantitative methods are integrated to achieve the research objectives, one of the three outcomes from the data integration may arise, with the data triangulation being convergent, complementary, or divergent. Each of these illustrates how the metaphor of triangulation could be utilised to interpret mixed-method findings to draw conclusions. Furthermore, the metaphor of triangulation can be used to clarify the links between data sets (Östlund et al., 2011, Erzberger and Kelle, 2003). The definitions for each of the potential outcomes are given in Table 7.1.

Table 7.1 The use of triangulation based on the quantitative and qualitative findings (Erzberger and Kelle, 2003).

Triangle of the quantitative and qualitative results	Findings
Convergent	Quantitative and qualitative findings lead to the same conclusions.
Complementary	Quantitative and qualitative findings can be used to supplement each other.
Divergent	Quantitative and qualitative findings give contradictory or discrepancy findings.

7.3 Findings and discussion from the integration of the mixed-methods data

Data were collected from an urban older population in three districts in Depok, West Java province, Indonesia. Three hundred sixty-three participants met the inclusion criteria to participate in the quantitative data collection phase, which included an oral health examination and the completion of questionnaires. Almost 75 per cent of these older people were diagnosed with chronic generalised periodontitis based on the clinical assessment criteria. The analysis of these quantitative data can be found in Chapter 5.

Thirty-two subjects who were diagnosed with chronic generalised periodontitis, according to our definition, were recruited to participate in the qualitative data collection. However, only data from 31 participants were eligible for the analysis. These participants were interviewed regarding their experiences with their periodontal disease. The details themes arising from the participants' interviews and discussion are presented in Chapter 6.

The findings from the integration of these quantitative and qualitative data are given in Table 7.2. There were two major comparisons between the quantitative and qualitative results:

1. Periodontal status and its impacts on the urban older people's OHRQoL
2. Oral health condition related to the progression of the periodontal disease and its implications on the urban older people's OHRQoL.

Table 7.2 Triangulation data findings from the quantitative and qualitative data analyses.

Issue	Quantitative Findings	Qualitative Findings	Integration data findings
Periodontal status and its impacts on the urban older people's OHRQoL.	Periodontal disease status of the urban older people in this population was not statistically significantly associated with the risk of having impacts on the OHRQoL. This result was based on the assessments of the prevalence, severity, and extent of the impacts of the OHIP-14.	Participants reported oral health conditions likely related to periodontal disease, which affected their well-being. Participants suggested that the problems related to periodontal disease affected their daily life in various ways, such as causing them pain, physical discomfort, functional limitations, physical activity restriction, psychological discomfort and disability, and social disability.	Divergent findings: There were discrepancy between quantitative findings and qualitative findings.
Oral health condition related to the progression of the periodontal disease and its impacts on the urban older people's OHRQoL.	There was a statistically significant relationship between tooth mobility status and OHRQoL. This result was based on the assessments of the prevalence, severity, and extent of the impacts of the OHIP-14.	Participants perceived tooth mobility affected their quality of life in term of causing them physical pain and discomfort, difficulties while eating and brushing, psychological distress, and affected their social interactions with others.	Convergent findings: Confirmation between quantitative findings and qualitative findings

Table 7. 2 continued.

Issue	Quantitative Findings	Qualitative Findings	Integration data findings
Oral health condition related to the severity of the periodontal disease and its implications on the urban older people's quality of life.	There was a statistically significant relationship between furcation involvement and OHRQoL. This result was based on the extent of the impacts of the OHIP-14. However, there was no statistically significant relationship between the furcation involvement and OHRQoL based on the prevalence and severity of the measurements of the impact.	Qualitative data did not identify any issue regarding furcation status.	The data triangulation for the impacts of furcation involvement on the urban older population' daily life was considered as a silence finding or no overlap findings between the quantitative and qualitative data.

7.3.1 Periodontal status and its impacts on urban older people's quality of life.

There was a discrepancy between the quantitative data findings and the qualitative data findings regarding the impacts of periodontal disease on the urban older people's quality of life.

The prevalence of the impacts of periodontal disease on participants' quality of life was comparable between older people who did not have chronic generalised periodontitis (74.7%) and those who did have chronic generalised periodontitis (73.2%). The severity of the impacts was quite similar between the two groups with mean scores of 11.91 and 11.85, respectively. In addition to this, the extent of the impacts was also very similar between the groups with

mean ranks of 182.05 and 181.98, respectively. Thus, the quantitative findings did not find any significant relationship between periodontal disease status at the time of assessment and OHRQoL in this urban older population. As an explanation of this discrepancy is that many of these older people had missing teeth, which would likely have been lost through periodontal disease. Thus, their remaining teeth with periodontal pockets on the data collection day showed less than 30 per cent from the total remaining teeth to be classified in the generalised periodontitis category. So whilst they might had “disease experience” a combination of their lack of awareness of periodontal disease, signs and symptoms of periodontal disease, and the relative health of the remaining teeth at the point of data collection would confound this outcome.

Conversely, the qualitative data identified themes related to oral health problems that were likely related to periodontal disease experience, which affected participants’ daily life. There were four of five components of quality of life from the Locker’s model highlighted by the participants; impairment, pain and discomfort, functional limitations, and disability. However, a handicap as the fifth component of the model did not emerge in our qualitative data. This finding can be understood as handicap corresponds to a very high impact of a disease on someone’s lives resulting in their not being able to function at all.

The divergent results from the quantitative and qualitative data findings might be explained by the qualitative data regarding the beliefs and expectations of the urban older people toward their periodontal disease. Although these older people felt disturbed by some of the oral problems likely related to periodontal disease, there was a widely accepted belief in this society that the signs of periodontal disease are inevitable consequences of ageing rather than as a product of a disease that could have been prevented.

The widely accepted misconception about tooth loss being an inevitable part of ageing alongside the individuals and environmental characteristics of the participants might contribute to the older people resilience toward their oral impairments likely related to periodontal disease. The resilience could be seen from the qualitative data that some of the older people reacted passively to

their periodontal disease despite highlighting some negative impacts on their day to day life. Some of them also expressed they had adapted to their oral problems and suggested some coping strategies to deal with the conditions related to the periodontal disease daily. As an illustration from the qualitative data, participants introduced eating on the side of the mouth with fewer problems, swallowing foods together with water, only eating softly textured foods, cooking food until it was very soft and avoiding hot or cold foods as strategies to cope with their eating difficulty caused by sensitive teeth, loose teeth, and tooth loss.

This misleading belief and resilience attitude toward periodontal disease shown by the participants might affect their expectations about common oral health conditions and its normal functions in old age. Furthermore, it might also affect how these older people' subjectively rated their oral health-related quality of life in the Oral Health Impact Profile (OHIP-14) questionnaire.

In accordance with our findings, a previous qualitative study which involved 24 elderly as participants conducted in Vancouver (Canada) also underlined acceptance of the oral health conditions as a consequence of normal ageing process influence older people' resilience and their subjective perceptions toward oral health. Some of the participants also showed that they were aware that they had oral problems from time to time, but emphasised that they had also adapted with the condition through the time (Macentee et al., 1997).

The inference findings from quantitative and qualitative data explain above are summarised in the triangulation model in Figure 7.2.

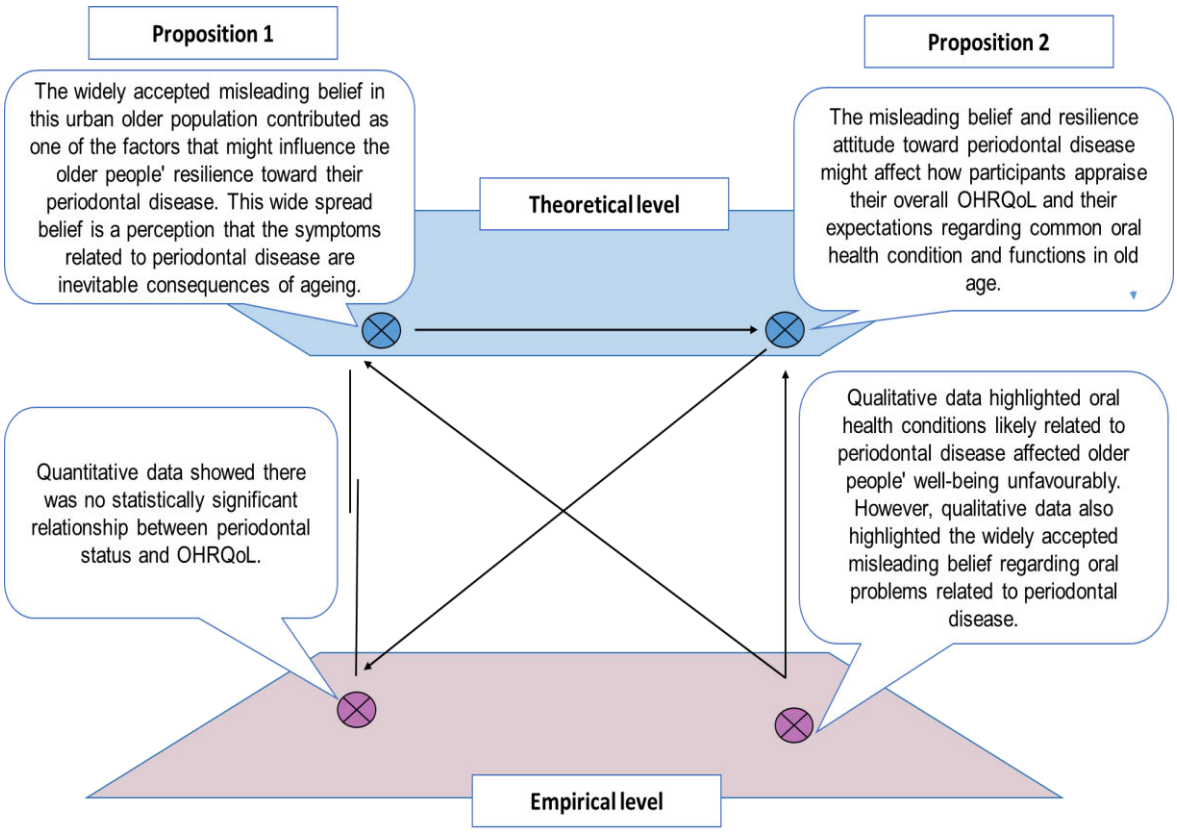

Figure 7.2 Illustration of the triangulation on the divergent results between quantitative and qualitative findings regarding the impacts of periodontal disease on the urban older people's quality of life. The pink points in the illustration represent the empirical findings from quantitative and qualitative research. The blue points represent the theoretical propositions derived from the quantitative and qualitative results. The lines connecting the points illustrate the logical relationship between the empirical and theoretical level. The broken line illustrates that the theoretical proposition 1 was not derived from the quantitative findings, but the qualitative findings supported this proposition. The proposition 2 was derived from the qualitative findings and could be a potential explanation of the discrepancy findings between the empirical quantitative and qualitative findings. The theoretical propositions inferred from the mixed-methods data integration is that misleading belief could be one of the crucial factors which might give an impact on the urban older people' resilience toward periodontal disease. This belief and resilience might affect the way these older people see their oral health conditions and normal function in old age. Furthermore, it might also influence how they rate their oral health-related quality of life.

7.3.2 Oral health condition related to the progression of the periodontal disease and its impacts on the urban older people's quality of life.

The quantitative study assessed tooth mobility and furcation involvement of the participants as signs related to the progression of periodontal disease, which involves bone destructions and loss attachment. Increasing mobility and multiple teeth with furcation involvement would give an indicator of the severity of disease in any given person.

The quantitative data were in agreement with the qualitative findings regarding the impacts of tooth mobility on the urban older people's quality of life. The quantitative data analysis confirm the relationship between tooth mobility status and OHRQoL in this study population. The assessment of this relationship was based on the effect of having teeth with increased mobility status and the OHRQoL measured by the prevalence, severity, and extent of the impacts of the OHIP. The details of the statistical analysis results are presented in Chapter 5.

In accordance with the quantitative study results, the qualitative data findings found themes related to tooth mobility affecting participants' daily life with negative impacts on participants' well-being. The deleterious effects of tooth mobility evoked some oral health problems and discomfort which were hard to ignore by the older people. The impacts of having loose teeth were perceived as noticeable and affecting various aspects of their life. The negative impacts highlighted were pain, eating difficulty, affect eating enjoyment, dietary restrictions, and discomfort while brushing teeth. Besides these reported functional limitations, participants also expressed that their loose teeth had an impact on their psychological and social function. For instance, one of the participants was reluctant to eat certain foods in public because she was afraid of losing her loose teeth in front of others. Tooth mobility was also reported as being accompanied by other problems related to periodontal disease, such as bleeding gums, plaque and calculus, and receding gums. These other oral problems accompanying tooth mobility might reinforce the negative impacts on well-being perceived by the older people.

Participants also described their coping strategies to overcome their loose teeth, such as eating on the side of the jaw with better teeth condition, eating soft texture foods, being very careful while brushing their teeth, and cooking foods on a very long time until the consistency of the foods were very soft.

The finding related to tooth mobility as one of clinical symptoms of the advanced periodontal disease progression and its impacts on the older people's quality of life can also expand the understanding of the relationship between periodontal disease and OHRQoL in this study population. It is shown that the symptoms of periodontal disease need to reach a certain threshold before this population under the study perceived them as a problem which can affect their quality of life, such as tooth mobility and the ultimate extend of the tooth mobility which is tooth loss. Thus, these findings might also reflect to lack of periodontal disease awareness and knowledge in this study population.

The inference findings from quantitative and qualitative data regarding tooth mobility and urban older' OHRQoL are illustrated in the triangulation model in Figure 7.3.

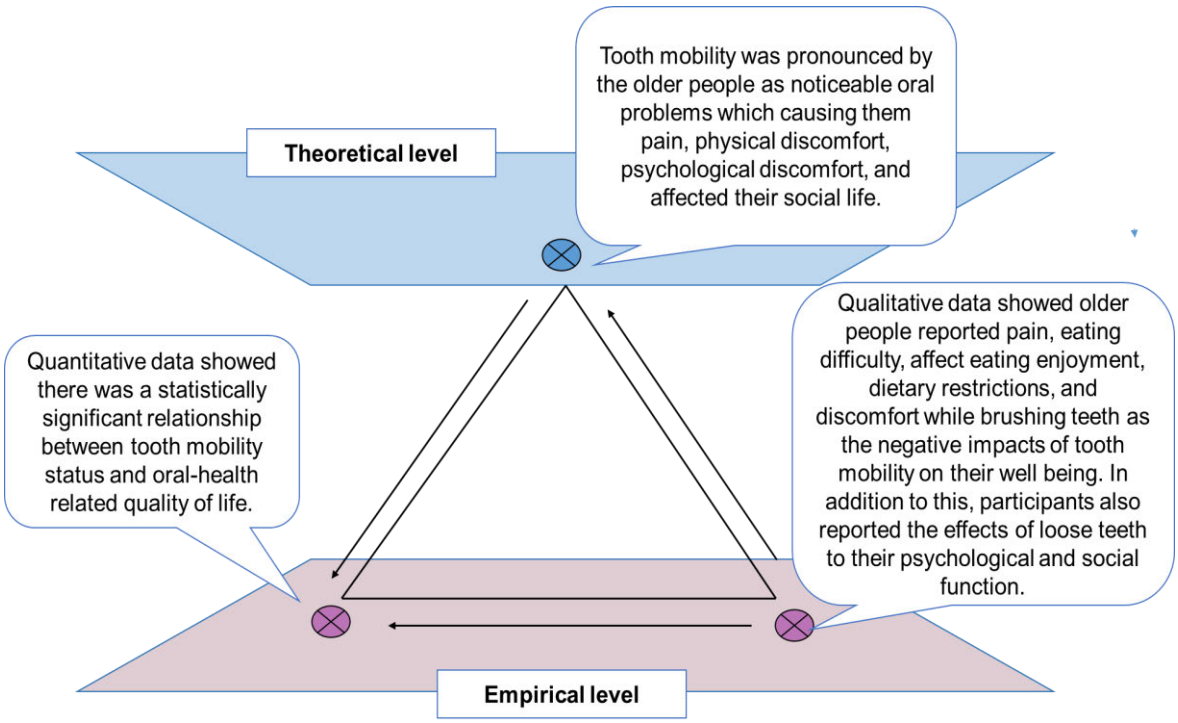

Figure 7. 3 Illustration of the triangulation on the convergent results between quantitative data and qualitative data findings regarding the impacts of loose teeth on urban older people's quality of life. The pink points of the illustration represent the empirical findings from quantitative and qualitative research. The blue points represent the theoretical propositions from the quantitative and qualitative results. The lines connecting the points illustrate the logical relationship between the empirical and theoretical level. The theoretical proposition offered from this mixed-methods data integration is the urban older people involved in this study felt having loose teeth had noticeably affected their quality of life negatively in term of causing them pain, physical discomfort, psychological discomfort, and affected their social life.

The furcation involvement examination was performed during the quantitative data collection as one of the oral health signs related to the progression of periodontal disease. During that analysis, there was a significant relationship between the tooth furcation status and the extent of the impacts on the older people' quality of life, but no difference was seen for the prevalence and severity of the impacts assessments.

Conversely, analysis of the qualitative data did not find any themes related to furcation involvement. Thus, the data triangulation of the impacts of furcation involvement on the urban older' OHRQoL was considered silence findings or no overlap findings. This silence finding is likely to be explained by subjects

simply not being aware of what a furcation involvement is in this study population. However, they were aware of and related to the other sign of disease progression we used, tooth mobility. We have to underline that furcation involvement involves bone support destruction around the multirooted teeth. Thus, this condition might also be reported by the participants as causing problems related to tooth mobility.

7.4 Strengths and limitations of the study

To our knowledge, this study is the first research which has used a mixed-method design in accessing the impacts of periodontal disease on the urban older' OHRQoL in Indonesia and one of few globally. The mixed-methods data integration overcomes the limitations of data findings of single study design. The quantitative study findings provide information about statistically analyses results regarding the relationship between periodontal disease and the urban older people' subjective assessment toward their OHRQoL. On the other hand, the qualitative study expands the quantitative findings with understanding participants' perceptions and experiences with their periodontal disease and the impacts of this disease to their well-being.

The qualitative data findings which used urban older people as participants in this study may not be generalisable beyond this setting. Thus, it will be interesting to see if similar outcomes could be found in the general adult population in Indonesia as study participants or in different countries background. In addition to this, the classification of the periodontal status into non-generalised periodontitis and generalised periodontitis in this study may also bring some limitation in accessing the relationship between periodontal disease and oral health quality of life. More details periodontal status categorisation into no teeth with periodontal pocket, localised periodontitis, and generalised periodontitis in a future study may give a better understanding of the relationship between periodontal disease and quality of life in this older population in Indonesia. More details of the strengths and limitations of the

study for each quantitative and qualitative research can be found in Chapter 5 and 6, respectively.

To minimise the limitations of each quantitative and qualitative study describes above, this chapter utilised data triangulation from each quantitative and qualitative study to provide a deeper understanding of the impacts of periodontal disease on urban older people' quality of life. Thus, the results from this mixed-methods data integration may enhance the transferability of the study results to other settings, such as the Indonesian general adult population or different developing countries study background.

Some of the quantitative measures we used (for example furcation involvement) can not be transferred directly into the qualitative field as people often do not know that their teeth have furcation involvement unless they have been told so by a dentist. Triangulation in this circumstance is difficult and likely resulted in the silence finding reported above.

The findings of this study may also be used by dentists, health practitioners, and the Ministry of Health in Indonesia to put more effort into periodontal disease awareness in an adult population, particularly the older population. Oral health promotions which include information about the periodontal disease may correct the misleading belief in this society regarding the oral impairments likely related to periodontal disease. Moreover, better oral health awareness can be an effective way to prevent the progression of advanced periodontal disease and other oral health problems which may poyentially reduce the quality of life.

7.5 Conclusions

This mixed-methods study clearly identifies the importance of understanding the urban older people' perceptions regarding periodontal disease and their subjective periodontal disease experiences.

The urban older people who participated in this study expressed that some impairments likely related to periodontal disease had impacts on their well-

being. Nevertheless, the apparent belief that the signs of periodontal disease were inevitable consequences of the normal ageing process contributed as one of the factors which may prevent these older people from seeking dental treatments to overcome their periodontal disease. Besides individuals and environmental characteristics of the individuals, this widely accepted misconceptions in the society might also influence the older people' expectations of common oral health condition in old age. Ultimately, some of these older people accepted the impacts of periodontal disease on their quality of life without looking for any dental treatments to overcome the periodontal disease. In fact, periodontal disease prevention and treatments might help them to maintain their oral health normal function and retaining their natural teeth longer in the mouth, which supports a better quality of life in old age.

Nevertheless, the integration of these data underlined the agreement between the quantitative and qualitative data regarding the negative impacts of tooth mobility on the urban older people' OHRQoL. Tooth mobility is one of the signs of advanced progression of periodontal disease that is easily discerned by both dentist and an individual. This sign of periodontal disease brought significant and noticeable negative impacts which include pain, physical discomfort, psychological discomfort, and affecting social life.

The data integration regarding the impact of tooth furcation involvement on the quality of life showed no overlap findings between the quantitative and qualitative data. This is likely due to a lack of awareness among people about furcation involvement. Thus, participants would likely overlap this condition with tooth mobility as both are a product of the destruction of bone support around the multirooted teeth.

Chapter 8 Conclusions

8.1 Conclusions

The aim of this thesis has been to examine the relationship between quality of life and periodontal disease in the ageing population in Indonesia as well as understanding their personal experiences of periodontal disease through a mixed-methods approach.

A review of the previous literature on the relationship between periodontal disease and oral health-related quality of life was performed to identify knowledge gaps and the issue related to the periodontal disease in an ageing population. This research was conducted in a developing country as a research background. Then following specific objectives were derived from the identified gaps:

1. To investigate the relationship between quantitative measures of oral health-related quality of life and periodontal diseases in the urban ageing population in Indonesia.

2. To explore and understand the relationship identified through the outcomes of the quantitative process with a qualitative approach using semi-structured interviews. This would enable the development of an understanding of the relationship between quality of life and periodontal disease in the urban ageing population based on their personal experiences, attitudes, and behaviour toward periodontal disease in the natural setting.

3. To provide comprehensive findings on the impacts of periodontal disease and oral health-related quality of life of the urban older population in Indonesia through the quantitative and qualitative data integration.

These specific objectives have been achieved in the studies reported in Chapter 5, 6, and 7 of this thesis. Summaries of the achievements are given in the following paragraphs.

8.1.1 The relationship between oral health-related quality of life and periodontal diseases in the ageing population in Indonesia measured based on the Oral Health Impact Profile.

The first objective has been achieved by the study reported in Chapter 5. Participants in this study were native Indonesian adults of age 50 years old and above currently living in Depok, Indonesia. Three hundred and sixty-three participants participated in this stage of the quantitative data collection. The data collected for this stage include clinical oral health examinations and questionnaires completion.

The intraoral examination was used to record dental and periodontal health, and the quality of personal oral hygiene. Periodontal disease status was measured based on the Basic Periodontal Examination (BPE) developed by the British Society of Periodontology.

The periodontal condition of the participants was categorised into generalised and non-generalised periodontitis, depending on the distribution of pocketing, for the purpose of the analysis. This study also recorded tooth furcation involvement and tooth mobility status as conditions related to the progression of the periodontal disease.

In addition to the periodontal condition, this study examined dental health and personal oral hygiene. The Decayed, Missing, and Filled Teeth Index (DMF-T) was used to report dental health. Personal oral hygiene was assessed using the Simplified Oral Hygiene Index (OHI-S). The details of the intraoral examination can be found in Chapter 3.

Oral health-related quality of life (OHRQoL) was measured using the short form of Oral Health Impact Profile (OHIP-14). There were seven domains and 14 questions in the OHIP-14 questionnaire. The domains of the OHIP include functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap aspects. The OHIP questionnaire allows the participants to do self-assessment toward their well-being. The impacts of the teeth and periodontal conditions on quality of life was measured based on the severity, extent, and prevalence of the impacts.

Our research did not show a significant relationship between the measures of participants' periodontal disease and their reported OHRQoL. Nevertheless, we were able to identify a significant relationship between increased tooth mobility and OHRQoL based on the prevalence, severity, and extent of the impacts. These data show that tooth mobility is the first clinical sign of periodontal disease that has an impact on OHQoL despite it being a late sign of disease progression. Mobility was significantly associated with five of the seven domains of OHIP, which were functional limitation, physical pain, psychological discomfort, physical disability, and handicap. Psychological disability and social disability domains were not associated with tooth mobility status of the participants.

The relationship between tooth furcation status and the extent of the impacts on the quality of life showed a statistically significant relationship, but no difference was seen for the prevalence and severity of the impacts assessments.

In addition to the measurements of the relationship between OHRQoL and periodontal diseases reported above, this study also identified several environmental and social predictors which were associated with the OHRQoL of the population under study. These include brushing habits, dental visit, family income, DMF-T status, and subjective assessment of dental health. Individuals who brushed their teeth at least two times a day had a better quality of life than those who brushed their teeth fewer than two times a day based on

the severity and prevalence of the impact assessment. Individuals who routinely attend the dentist to check their dental condition at least once a year reported a better quality of life than those who did not have a routine dental check-up based on the extent of the impact assessment. Older people who have income more than minimum wage reported a better quality of life than those who have minimum wage and under the minimum salary based on the extent of the impact measurement. Participants who had a DMF-T score of eight or less reported a better quality of life compared with those who had DMF-T score of nine or more based on the severity and extent of the impact measurement.

Finally, as expected, individuals subjectively assessed their dental health condition as poor were more likely reported worse OHRQoL based on both the severity and extent of the impact assessments.

8.1.2 The relationship between quality of life and periodontal disease in the urban ageing population in Indonesia based on their personal experiences with the periodontal disease

Various aspects of the second objective have been addressed in Chapter 6. The qualitative research utilised an interview topic guide as an instrument for conducting semi-structured interviews data collection. A pilot study was performed in Edinburgh before the data collection in Indonesia. This pilot was used to assess the effectiveness and appropriateness of the interview topic guide. Then, the interview topic guide was modified based on the feedback from the participants in the pilot study to enhance the use of the interview topic guide for the data collection in Indonesia. The details regarding the pilot and the interview topic guide can be found in Chapter 4.

The selection of the participants to be involved as an interviewee in this qualitative study was based on purposeful sampling criteria, which consider the periodontal condition, gender, level of education, and age as major variations in the participants. The details information of the participants was

obtained from the quantitative data collection, which was done before the qualitative data collection.

The periodontal condition of the interest in this study is generalised periodontitis with various Basic Periodontal Examination (BPE) scores. In addition to this, the gender balance was also ensured for the sample recruited. Other variations, such as level of education and age, were also considered in the selection of the participants. These variations were considered as the criteria of recruitment to obtain the depth and richness of the qualitative data collection.

The data were collected until the thematic saturation achieved, which followed the principles proposed by Francis and colleagues. There were 32 participants recruited to participate as interviewees. However, one participant was excluded from the analysis as she felt tired and could not continue the interview.

The data coding involved two coders who work independently to ensure the reliability of the study. The first coder is me as a PhD student, and the second coder is a colleague from Universitas Indonesia. Then, the comparison of the themes coding results between the two coders was discussed, especially when there were any discrepancies between the two coders. The final themes coding which had been agreed by the two coders then presented as the qualitative study results in Chapter 6. The details of the research methodology of the data collection can be found in Chapter 3.

The study findings related to the periodontal impact on the urban older' OHRQoL are in accordance with Locker's conceptual model of oral health. This study reported impacts on OHRQoL in the domains of impairment, pain and discomfort, functional limitations, and disability caused by oral conditions likely related to periodontal disease. However, we did not find any handicap associated with periodontal disease. This not surprising as handicap was defined as a state of not being to function at all and usually caused by a very high impact on someone's life.

Interestingly, our data found that a widely accepted misleading belief in the older people population likely affected their expectations regarding the normal oral function in old age. Some of the oral problems associated with the progression of periodontal disease were not always perceived as discomfort, disability, or handicap because they were often accepted as an inevitable part of the normal ageing process, for example, loose teeth and tooth loss.

Unbearable pain which did not settle down with self-care was the most commonly reported trigger and motivation for the participants to go to the dentist and search for dental treatment. However, this study also identified seven participants who reported that they had never been to a dentist despite having a painful toothache and other oral health problems. Nonetheless, our data also found two participants who done a regular dental check-up to maintain their oral health and one participant who reported that he had routine dental check-up while he still working for a government institution, but had stopped when he retired.

The extent of periodontal disease affected participants' psychological and social aspects of life as well as physical functional issues. Participants reported being self-conscious about having bad breath or dirty teeth, worrying about losing teeth, poor appearance and emotional feelings had affected these older people' self-confidence. These psychological discomforts and disability might also negatively affect their social interactions.

The conceptual framework of the PhD study was intended to provide information about the main things to be studied, which involved a key factor of the research interest and predictor variables. The outcome of interest focussed on the oral health-related quality of life (OHRQoL), which had been assessed from both quantitative and qualitative perspective. The quantitative data was collected through oral health examination and a structured questionnaire. The variables of the individual factors which might act as predictors were included in the questionnaire, such as socio-economic, demographic, behavioural, and the OHIP-14 assessment. Oral health examination includes oral hygiene, teeth

condition, and periodontal condition. This conceptual framework also presumes a possible relationship between OHRQoL and the individual factors.

Nevertheless, our qualitative data collection, which utilised semi-structured interviews, gave an opportunity to explore and understand participants' periodontal disease experiences and any factors which may affect their subjective experience toward periodontal disease and its effect on the quality of life. Thus, the qualitative data exploration was not limited to the potential individuals' factors influence OHRQoL, but also gave room for participants to discuss possible environmental factors which may influence their OHRQoL.
The qualitative study findings highlighted the importance of individual and environmental characteristics of participants' periodontal disease experiences and their overall OHRQoL. The personal characteristics mentioned by the participants include preference of oral health maintenance, behaviour in seeking oral health information, personal strategies to cope with oral health problems, perceived need for dental care, harmful oral health habits, traumatic experiences which affect participants' behaviour toward oral health, and retrospective regret due to oral health problems in the past. The environmental characteristics identified were sources of oral health information available, accessibility of oral health care and treatment, facilitators and barriers to accessing oral health services, social and psychological support to overcome oral health problems. These findings were in agreement with the previous conceptual model of health-related quality of life proposed by Wilson and Cleary (Wilson and Cleary, 1995).

8.1.3 Mixed-methods integration outcomes: the impacts of periodontal disease on oral health-related quality of life of the urban older population in Indonesia.

The third objective has been accomplished through the mixed-methods data integration presented in Chapter 7. The data integration combines the results from both quantitative and qualitative studies which presented in Chapter 5 and 6, respectively. This mixed-methods approach was utilised to provide a

complementary strength of the multiple methods and obtain details and rich data regarding the impacts of periodontal disease on the OHRQoL of the urban older population in Depok, Indonesia.

This mixed-methods study utilised a sequential explanatory strategy, where the quantitative data were collected before the qualitative data. Quantitative data was used to inform the selection of the participants invited to be involved in the qualitative study. The selection of the interviewees accommodates the variations in their range of BPE scores of their generalised chronic periodontitis, gender, level of education, and age. These participants' information was obtained from the quantitative data collection, which was done before the qualitative data collection.

Integration data used a triangulation methodological metaphor proposed by the Erzberger and Kelle. The triangulation was used to give the comparison of the similarities and differences between the quantitative and qualitative results in the empirical level. Furthermore, the triangulation data was utilised to understand the logical relationship between the empirical findings and theoretical propositions. These theoretical propositions were derived from quantitative and qualitative results.

Three hundred sixty-three participants and 31 participants met the inclusion criteria of participation and eligibility for the data analyses of the quantitative and qualitative studies, respectively.

There were divergent results between the quantitative and qualitative studies regarding the impacts of periodontal disease on the urban older people's OHRQoL. The analysis of the quantitative data found no significant relationship between periodontal status and the participants' reported OHRQoL. Conversely, participants in the qualitative study reported oral health conditions likely related to periodontal disease, which affected their well-being, including pain and discomfort, functional limitations, and psychological discomfort, psychological disability, and social disability.

The qualitative data were captured from a sample that we know had a generalised periodontal disease which may help to explain this dichotomy. In addition, the theoretical propositions derived from the data integration underlined the importance of misleading beliefs in relation to oral health expectations in later life as one of the crucial factors alongside other individuals and environmental factors. This misleading belief likely contributes towards the older people resilience toward or acceptance of the signs associated with their periodontal disease. Furthermore, it might affect these older people' oral health expectations in old age and how they perceived their overall quality of life.

Beside the periodontal status, this mixed-methods data integration examined the relationship between the signs of advanced progression of periodontal disease and quality of life, which include the impacts of tooth mobility and tooth furcation involvement on the OHRQoL.

Both quantitative and qualitative data results confirmed the negative impacts of having loose teeth on the urban older people's OHRQoL. The quantitative data showed a statistically significant relationship between tooth mobility status and the older people' OHRQoL based on all of the OHIP-14 assessments. The OHIP-14 measurements include prevalence, severity, and extent of the impact on the quality of life.

In agreement with the quantitative study results, the qualitative data reported the impact of having loose teeth on participants' well-being. According to the qualitative study, the negative implications of tooth mobility brought noticeable problems and discomfort to these older people. The functional limitations caused by tooth mobility reported include pain, eating difficulty, affecting eating enjoyment, dietary restrictions, and discomfort while brushing teeth. Tooth mobility was also affected aspects of psychological and social function. Furthermore, the qualitative data highlighted that other oral health problems that occur concurrently with loose teeth, such as bleeding gums, plaque and calculus, and receding gums reinforce the noticeable negative impacts on the participants' day to day life. The theoretical proposition concluded form this mixed-methods data integration is that tooth mobility had affected participants'

day to day life noticeably. The negative impacts of having loose teeth include pain, physical discomfort, psychological discomfort, and might also had an impact on older people' social function.

The quantitative data analysis identified tooth furcation involvement from the advanced progression of the periodontal disease was significantly associated with the extent of the impacts on the OHRQoL. Whereas, there were no matched thematic findings in the qualitative data analysis. This lack of overlap can be explained as furcation involvement is measured by dental professionals, and the term of furcation involvement is not familiar to the laypeople. However, we have to highlight that furcation involvement refers to the destruction of bone support around the multirooted teeth. Thus, this condition can also be reported by the participants as loose teeth.

8.2 Recommendations for further works

As in any study, the work presented in this thesis exhibits some limitations which described in details in each Chapter 5, 6, and 7. Several recommendations which may potentially enhance the study about the relationship between periodontal disease and OHRQoL are discussed in the following paragraphs.

Establishing the Minimally Important Difference (MID) of the OHIP in cross-sectional studies with a non-normal distribution of the OHIP's severity of the impact score.

Determining the MID in the context of cross-sectional studies will improve the ability to interpret the results of similar studies in the future. Previous longitudinal studies have attempted to calculate and establish the MID for OHRQoL, which used the OHIP as a patients-based outcome measure (this can be seen in Chapter 2. Literature Review, section 2.2.3.1).

Although some previous works have suggested using the distribution-based methods (effect size (ES) and standard error of measurement (SEM)) as an estimation of the MID, there are none of the previous works reported the MID for a cross-sectional study with a non-normal distribution of the OHIP's severity score. Furthermore, exploration of the MID should focus on whether this influence by the population being studied, for example, the MID for a population of young adults might be different from the elderly population.

The categorisation of the periodontal status to be used as the explanatory variable.

This study dichotomised the periodontal status into generalised and non-generalised periodontitis, with generalised periodontitis being defined as participants having 30 per cent or more of their remaining teeth affected by periodontitis. The results from the oral health examination conducted in the quantitative data collection phase found only 3 % of the urban older people had a healthy periodontal condition and 97% having periodontal pockets (75% generalised and 22% localised according to our definition). Future research with a more detailed categorisation of the periodontal status may deliver a better understanding of the relationship between the periodontal disease andOHRQoL.

Future qualitative research about the relationship between periodontal disease and oral health-related quality of life which involve a broader population.

A qualitative study has a context-specific nature which may limit the transferability of these findings. Thus, this work may potentially to be extended with a broader population in Indonesia as participants, for instance, recruiting both urban and rural, younger and older people in Indonesia. Thus, we can assess the generalisability of these study findings to the general population of

Indonesians. Moreover, it will be interesting to see if the same results appear with the general adult population in Indonesia as these participants.

In addition to this, it will be fascinating to compare the similarities and differences of this presented study with other future studies about the impacts of periodontal disease on the OHRQoL with different countries backgrounds from both developed and developing countries.

8.3 Opportunities to reduce the burden of periodontal disease on older people in Indonesia based on the thesis research findings

This thesis has identified a lack of awareness of periodontal disease in the Indonesian urban older people despite the professional knowledge that the progression of periodontitis can be prevented through healthy lifestyles, and effective treatment and management of the early stage of periodontal disease (Tonetti et al., 2017, Chapple et al., 2017, Jepsen et al., 2017, Petersen et al., 2005b). Our qualitative data found a widespread misleading belief about oral health and ageing in this society. Older people in this population believe that some of the oral health problems likely related to periodontal disease have to be accepted as a part of an inevitable process of ageing. Thus, lack of awareness and the wrong belief in this society might contribute to the periodontal disease being neglected. Ultimately, this periodontal disease might progress to an advanced stage which potentially affected people's quality of life, such as causing pain, physical discomfort, functional limitations, physical activity restriction, psychological discomfort and disability, and social disability.

This field findings regarding the periodontal disease awareness and wrong belief in the society can be addressed through prevention efforts described below:

1. **Integrated general health and oral health education with a population-based approach.**

   This health education can be used to introduce periodontal disease and its risk factors, which include the local, systemic, and non-modifiable factors. This public health campaigns can be tailored for different population groups, for example elderly, adolescents, and pregnant women. Moreover, health educators also need to address the widespread belief regarding periodontal disease. Health educators need to explain that chronic periodontitis is an age-associated disease and not an age-related disease. In other words, it is not the age of the individual that cause the oral health problems related to periodontal disease, but rather than the length of time that the periodontal tissues are challenged by chronic plaque accumulation. Thus, the progression of periodontitis can be prevented and treated, and individuals can have an opportunity to retain their teeth normal functions longer, which can support their quality of life.

2. **Oral health promotion to do routine dental check-ups.**

   We have shown that as few as 7.2 per cent of urban older people participating in the study reported that they had a routine dental check-up at least once a year.

   Early signs of periodontal disease can be detected in the regular dental check-ups. Appropriate treatment and secondary prevention can be applied if there are any signs of periodontal disease during this routine dental check-ups to prevent the progression of periodontal disease to its advanced stage. Thus, it is crucial to promote regular dental check-ups, particularly targeting older people in this Indonesians population. Moreover, our qualitative data highlight the importance of health

professionals' communication skills and attitude as one of the considerations in accessing dental health services, which can act as both facilitator and barrier depending on the context. Thus, it is crucial that health professionals have the ability to deliver oral health promotion in a friendly and thoughtful manner.

3. **Oral health professionals' instruction to maintain oral health hygiene, particularly in old age.**

   Oral health professionals should be encouraged to allocate time for oral hygiene maintenance during patients' dental visit appointment. The oral hygiene instructions include brushing, interdental cleaning, as well as healthy lifestyle advice, such as smoking cessation advice and healthy diet choices. The instruction for the maintenance of oral health, which includes teeth and periodontal tissue, should be tailored by the individual needs. For instance, dentists and oral health professionals need to take an account an individual's cognitive, motor functional skills, and someone who might be able to help to do the oral hygiene maintenance for old age patient. Dental professionals are also encouraged to highlight the importance of individuals' pro-active role in maintaining oral health and awareness to prevent the progression of periodontal disease and other oral health problems.

It is hoped that these prevention efforts can potentially improve OHRQoL older people in Indonesia. Thus, they can have a better awareness of the signs of periodontal disease and other oral health problems. It is expected that with the improvement in periodontal disease awareness, these older people will become more sensitive with the changes that happened to their oral health and will seek professional examination for early detection of the oral disease.

In addition to this, the oral hygiene instructions and early treatment of periodontal disease from dental professionals may improve the chance of these older people to preserve their natural teeth longer and its normal function, and reduce the possible adverse effect of periodontal disease burden

to their social life and financial burden associated with periodontal disease and its treatment.

8.4 Reflexivity

This PhD research had been an excellent opportunity to utilise both of my professional and educational backgrounds in dentistry and public health. I acknowledged that my professional and educational backgrounds might influence the direction of my research. These backgrounds also strongly affect my approach in presenting the thesis. As a dentist, I have the ability to determine appropriate oral health examination and its relevant index for my PhD project. Besides periodontal condition, oral hygiene and teeth condition may also potentially affect participants' OHRQoL. Thus, the oral health examination performed for this research was not only focused on periodontal disease assessment but also included oral hygiene and teeth condition examination. Furthermore, my principal supervisor is an expert in the dental health field; thus his expertise and experience have been beneficial for me to decide appropriate oral health examination indexes to be used as a part of quantitative research instruments.

My reading from previous research in the OHRQoL research had helped identify OHRQoL instrument to be used for my research, which was the OHIP-14. OHIP-14 was chosen in my study as it is unarguably one of the most widely used OHRQoL instrument, and it has been validated through cross-cultural adaptation in many languages to assess the relationship between oral health and well-being.

In addition to this, I understood that I potentially bring influences to the phenomena being studied starting from designing the interview topic guide, conducting the interviews, analysing the interview transcriptions, and presenting the qualitative study.

This mixed-method research also presented an opportunity and challenges for me to put myself in two perspectives, quantitative and qualitative perspective. I put myself as a logical positivist researcher and avoid any potential bias in

the study when I conducted quantitative research. On the other side, I embraced the possibility to have multiple realities from different individuals' perspectives and experiences toward periodontal disease and quality of life. I acted as a naturalistic researcher in the qualitative study, where I had interaction with the participants as an interviewer. Thus, I acknowledge my influences on the qualitative data being shaped.

This PhD project also gave valuable experience to work and organise a small research team for the data collection, which involve dentist colleagues and community health workers. Overall, I have learned and grown substantially in conducting mixed-method research during my PhD study time.

Appendices

Appendix 3.1 Ethics approval letter for the data collection in Indonesia from Ethics Committee of Faculty Dentistry, Universitas Indonesia (in Indonesian)

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PERSETUJUAN ETIK (*ETHICAL APPROVAL*)
Nomor: 138/Ethical Approval /FKGUI/XI/2017

Yang bertanda tangan di bawah ini, Komisi Etik Penelitian Kedokteran Gigi Fakultas Kedokteran Gigi Universitas Indonesia, setelah dilaksanakan pembahasan dan penilaian, dengan ini memutuskan protokol penelitian yang berjudul :

"Penyakit Periodontal dan Kesehatan Gigi dan Mulut yang Berkaitan dengan Kualitas Hidup pada Populasi Masyarakat Perkotaan Usia Tua"

No. Protokol: 071211017

Nama Peneliti Utama : Marisza Hijryana

Nama Institusi : - Edinburgh Dental Institute, the University of Edinburgh
- Fakultas Kedokteran Gigi, Universitas Indonesia

dapat disetujui pelaksanaannya. Persetujuan ini berlaku sejak tanggal ditetapkan sampai dengan batas waktu pelaksanaan penelitian seperti tertera dalam protokol.

Pada akhir penelitian, laporan pelaksanaan penelitian harus diserahkan kepada KEPKG-FKGUI. Jika ada perubahan protokol dan / atau perpanjangan penelitian, harus mengajukan kembali permohonan kajian etik penelitian (amandemen protokol).

Jakarta, 7 November 2017
Ketua Komisi Etik Penelitian
Kedokteran Gigi (KEPKG) FKG UI,

Prof. Anton Rahardjo, drg, MKM, PhD
NIP 195406021983031002

Keterangan/Notes:
Persetujuan etik ini berlaku selama satu tahun sejak tanggal ditetapkan.
Pada akhir penelitian, laporan pelaksanaan penelitian harus diserahkan ke Komisi Etik Penelitian Kedokteran Gigi FKGUI
Jika ada perubahan protokol dan atau perpanjang penelitian, harus mengajukan kembali permohonan kajian etik penelitian.

Appendix 3.2 Ethics approval for the data collection in Indonesia (Translated into English)

KOMISI ETIK PENELITIAN KEDOKTERAN GIGI (KEPKG)
FAKULTAS KEDOKTERAN GIGI
UNIVERSITAS INDONESIA

Jln. Salemba Raya No. 4 Jakarta Pusat 10430
Webmail: http://research.fkg.ui.ac.id/ethical-committee/
Telp. (62-21) 31906289; Fax: (62-21) 31906289

ETHICAL APPROVAL

Number: 138/Ethical Approval/FKGUI/XI/2017

This ethical approval letter signed by the Ethics Committee for Dentistry Research of the Faculty of Dentistry, Indonesia University (KEPKG-FKGUI), after discussion and evaluation, and the committee has made a decision below toward the research protocol:

"The Relationships between Periodontal Disease on Oral Health-Related Quality of Life of the Urban Older Population"

Protocol Number: 071211017

Main Researcher : Marisza Hijryana

Institution involved in Research : - Edinburgh Dental Institute, the University of Edinburgh
- Fakultas Kedokteran Gigi, Universitas Indonesia

The research protocol has been approved. This approval is valid from the date of this ethics approval until the end of the research stated in the research protocol.

At the end of the research data collection, a report of the research implementation should be submitted to KEPKG-FKGUI. If there is any change in protocol and/ or extension of the research, the main researcher should re-apply an ethics application (protocol amendments).

Jakarta, 7th November 2017

Head of the Ethics Committee for Dentistry Research
Faculty of Dentistry, Indonesia University (KEPKG-FKGUI),

Signed

Professor Anton Rahardjo, drg, M.K.M., Ph.D
NIP 195406021983031002

Appendix 3.3 Informed consent form for the quantitative data collection in English

Informed Consent (1)

Information leaflet and consent for participants having questionnaire and oral health examination session.

Study title:	Periodontal diseases and oral health related quality of life in the urban older population
Supervisor:	1. Professor Angus Walls (Principal Supervisor) 2. Dr. Margaret MacDougall (Second Supervisor)
PhD student:	Marisza Hijryana

You are being invited to take part in the first session of this research study. Before you decide whether or not to take part, it is important for you to understand what kind of research is being done and what it will involve. Please take your time to read the following information carefully.

Thank you for reading this.

1. Research title:
Periodontal Diseases and Oral Health Related Quality of Life in the Urban Older Population

2. Research information:
This study is a PhD research. The research topic is about oral and periodontal disease in the ageing Indonesian population.

3. Research aims:
To investigate the relationship between oral health-related quality of life and periodontal disease in the ageing population in Depok (Indonesia).

4. You will be accepted as a participant of this research if you could meet the following requirements:

- You should be native Indonesian adults of age 50 years old and above currently living in Depok.
- You should be willing and able to participate in the questionnaire completion and oral health examination.
- You should be able to provide consent.

5. Estimated number of subjects involved in this research:
Up to 359 subjects

6. Procedures / research procedures:

- Firstly, you have to read this information leaflet carefully. If you agree to contribute to the study, then you should complete and sign the consent form.
- Secondly, you will be asked to complete the questionnaire provided by the researcher. If you could not read the questionnaire, the community health worker or the dentist will read the questionnaire for you. The completion of this questionnaire takes a different amount of time with different people but commonly takes between 10 and 15 minutes.
- Then, you will have oral examination which consist of oral hygiene, intraoral, and periodontal examination. This examination could last up to 1 hour.
- At the end of this session, researcher will explain the second session of this research which is interview session. You may decide whether you would like to participate in the interview session or not.
  If you are interested to contribute further to this research, researcher will contact you for the next session. This session will be held on different day. We will arrange this session at your convenience time.
  If you decide not to involve further in the second session of this research, your involvement in this study is over. We appreciate your contribution to this study.

7. Risks and discomfort:

There are no known risks to participation in this study. It is considered unlikely that there will be adverse events arising from participation in this study. The oral health examination which will be performed in this study is considered safe. However, it is possible that there will be slight discomfort in the oral examination procedure. The researchers who will undertake the oral examination have experience in delivering oral health education, care, and treatment for patients with oral health problems. Furthermore, the appropriateness and effectivity of the questions in the questionnaire has been tested in the pilot prior to research data collection in Indonesia.

8. Immediate benefit for subject:

Involvement in this study means you are making contribution to the knowledge about oral health and quality of life issues. In addition to this, you will get an opportunity to know your latest oral health condition without having to pay for the examination.

9. Confidentiality of research data:

Your participation in this study will be kept confidential in any published work. No personal details that might identify you will be stored with your questionnaire and oral health examination results data which will be anonymized. We will take care to make sure that your identity can not be ascertained from any discussion of questionnaire and oral health examination findings.

10. Compensation or reward:
For participation in this study you will receive cash money Rp. 60.000 and sustenance (food and drink with nominal Rp.20.000) in recognition of the time involved in this project.

11. Volunteerism in research:
Your participation is voluntary. You could freely decide whether you would like to participate or not participate in this study. We will give you plenty of time to consider your decision.

12. Subject may withdraw / excluded from the study:
You may withdraw from the study at any time and for any reason. If you withdraw from the study, you will not be asked to return any benefit that you already received and there is no consequences for this.

Please note that unless I hear from you to the contrary, I will assume that you are agreeable to me using any data and feedback you may submit by means of the oral health examination data and questionnaire completion even if you advise me at a later stage that you wish to withdraw from the research.

13. Researcher's responsibility for any complain regarding the study:
The oral health examination and questionnaire completion are considered safe. It is very unlikely that there will be adverse events arising from your participation, so we are not provide any insurance for this study.

14. Researcher who responsible for this research:
This project has been reviewed and approved by the Ethics Committee, Faculty of Dentistry University of Indonesia.

If you have any concerns or questions at any time about the study or procedures, you may contact me via email address:
Marisza Hijryana
Email:

You may have some questions after you have read this information sheet. Please feel free to ask, to clear up any queries that you may have. You will be given a copy of this information sheet and also a copy of the signed consent form to keep if you would like to participate in this study.

Thank you for your help!

Consent Form (1)

Consent for participants having questionnaire and oral health examination session.

Please tick the box

1. I confirm that I have read and understand the information sheet for the above study. ☐
2. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
3. I agree to take part in the above study. I understand that my participation is voluntary and that I am free to withdraw at any time. ☐
4. a) I consent to completing questionnaire for the research project identified above. ☐
   b) I consent to having an oral health examination for the research project explained above. ☐
5. I agree that the data from oral health examination and questionnaire completion, and any data derived from them may be kept securely for the duration of 10 years post completion PhD study. ☐
6. I agree that information from oral health examination, questionnaire, and any analyses drawn from them may be used for research purposes (PhD thesis, presentations, and research articles). ☐
7. I understand that I will not be identifiable in any of those research written works. ☐

_____	_____	_____
Name of participant	Date	Signature
_____	_____	_____
Researcher	Date	Signature

Appendix 3.4 Infomed consent form for the quantitative data collection in Indonesian

Lembar Informasi dan Persetujuan (1)

Lembar informasi dan persetujuan untuk peserta yang akan berpatisipasi dalam pengisian kuesioner dan pemeriksaan kesehatan gigi-mulut.

Judul penelitian:	Penyakit Periodontal dan Kesehatan Gigi dan Mulut yang Berkaitan dengan Kualitas Hidup pada Populasi Masyarakat Perkotaan Usia Tua
Pembimbing:	1. Professor Angus Walls (Pembimbing Utama) 2. Dr. Margaret MacDougall (Pembimbing Kedua)
Mahasiswi S3 (PhD):	Drg. Marisza Hijryana., MPH

Anda diundang untuk berpartisipasi dalam penelitian ini. Sebelum anda memutuskan untuk berpartisipasi atau tidak, penting bagi anda untuk memahami penelitian yang akan dilakukan dan apa saja yang akan dilakukan. Silahkan luangkan waktu anda untuk membaca informasi berikut ini dengan seksama.

Terimakasih untuk membaca informasi ini.

1. Judul penelitian:
Penyakit Periodontal dan Kesehatan Gigi dan Mulut yang Berkaitan dengan Kualitas Hidup pada Populasi Masyarakat Perkotaan Usia Tua

2. Informasi mengenai penelitian:
Penelitian ini adalah penelitian studi S3. Topik penelitian mengenai kesehatan gigi-mulut dan jaringan pendukungnya pada masyarakat berusia tua di Indonesia.

3. Tujuan penelitian:
Untuk mengetahui hubungan antara kualitas hidup dan penyakit gigi mulut dan jaringan pendukungnya pada masyarakat berusia tua di kota Depok.

4. Anda akan dapat berpartisipasi sebagai peserta penelitian apabila memenuhi persyaratan berikut ini:

- Peserta adalah penduduk asli Indonesia berusia 50 tahun dan keatas yang saat ini tinggal pada wilayah kota Depok.
- Peserta bersedia untuk berpartisipasi pada pengisian kuesioner dan pemeriksaan kesehatan gigi-mulut.
- Peserta bersedia untuk memberikan persetujuan berpartisipasi.

5. Estimasi peserta yang akan terlibat pada penelitian ini:

Sampai dengan 359 peserta.

6. Tahapan penelitian:

- Pertama, anda dapat membaca lembaran informasi ini dengan sebaik-baiknya. Jika anda setuju untuk berpartisipasi, anda dapat mengisi dan menandatangani formulir persetujuan.
- Kedua, anda akan mengisi kuesioner yang telah disediakan. Jika anda tidak dapat membaca kuesioner tersebut, kader kesehatan atau peneliti akan membantu membacakan kuesioner penelitian untuk anda. Pengisian kuesioner ini umumnya membutuhkan waktu 10 sampai dengan 15 menit.
- Kemudian, anda akan mendapatkan pemeriksaan kesehatan gigi dan mulut. Pemeriksaan gigi dan mulut secara menyeluruh ini membutuhkan waktu kurang dari atau sampai dengan 1 jam.
- Di akhir sesi ini, peneliti akan menjelaskan tahapan kedua penelitian yaitu sesi wawancara. Anda dapat memutuskan apakah anda ingin berpartisipasi pada sesi wawancara atau tidak.

  Jika anda tertarik untuk berpartisipasi lebih lanjut pada penelitian ini sebagai peserta wawancara, peneliti akan menghubungi anda kembali. Sesi wawancara ini akan diadakan pada hari yang berbeda dari sesi pertama ini. Kami akan menghubungi anda mengenai waktu wawancara.

  Jika anda memutuskan untuk tidak berpartisipasi pada tahapan kedua penelitian ini, maka keterlibatan anda dalam penelitian ini dinyatakan telah selesai. Kami sangat menghargai partisipasi anda dalam penelitian ini.

7. Resiko dan ketidaknyamanan

Tidak ada risiko yang diketahui dari berpartisipasi dalam penelitian ini. Studi ini telah melalui pertimbangan sehingga dianggap tidak ada efek samping yang memungkinkan dari berpartisipasi dalam penelitian ini. Pemeriksaan kesehatan gigi dan mulut yang akan dilakukan dalam penelitian ini adalah aman bagi peserta. Namun, ada kemungkinan sedikit ketidaknyamanan saat

pemeriksaan gigi dan mulut. Peneliti yang akan melakukan pemeriksaan gigi ini memiliki pengalaman dalam memberikan pendidikan kesehatan gigi-mulut, perawatan dan pengobatan pasien yang memiliki masalah gigi-mulut. Selanjutnya, kepantasan dan efektifitas kuesioner telah diujicoba dalam pilot studi sebelum pengumpulan data penelitian ini.

8. Manfaat langsung dari berpartisipasi pada penelitian ini:
Anda berkontribusi pada pengetahuan tentang masalah kesehatan gigi-mulut dan kualitas kehidupan. Selain itu, anda mendapatkan kesempatan untuk mengetahui kondisi kesehatan gigi-mulut anda tanpa harus membayar jasa pemeriksaan.

9. Kerahasian data penelitian (*confidentiality*):
Partisipasi anda dalam penelitian ini akan dijaga kerahasiaannya dalam setiap karya tulis. Tidak ada informasi pribadi yang dapat mengidentifikasi anda yang akan disimpan bersama kuesioner dan hasil pemeriksaan gigi dan mulut akan di anonimkan. Kami akan memastikan bahwa anda tidak akan dapat diidentifikasi dari hasil temuan kuesioner dan pemeriksaan gigi-mulut.

10. Kompensasi atau hadiah
Anda akan menerima uang sebesar Rp.60.000 dan paket makanan box (berisi mkanan dan minuman senilai Rp. 20.000) sebagai kompensasi keikutsertaan dalam penelitian.

11. Kesukarelaan dalam penelitian
Partisipasi anda bersifat sukarela. Anda bisa dengan leluasa memutuskan apakah ingin berpartisipasi atau tidak berpartisipasi dalam penelitian ini.

12. Peserta dapat menarik diri dari penelitian:
Anda dapat menarik diri kapan saja dan untuk alasan apapun dari penelitian ini. Jika anda menarik diri dari penelitian ini, anda tidak akan diminta untuk mengembalikan keuntungan yang telah anda terima sebelumnya.

Harap diperhatikan bahwa kecuali saya mendengar dari anda sebaliknya, saya akan berasumsi anda setuju untuk saya menggunakan data dari hasil pemeriksaan kesehatan gigi-mulut dan kuesioner bahkan jika anda memberi tahu saya pada tahap selanjutnya bahwa anda ingin menarik diri dari penelitian.

13. Tanggung jawab peneliti apabila ada keluhan dari penelitian ini:
Pemeriksaan gigi-mulut dan pengisian kuesioner adalah aman. Sangat kecil kemungkinan terjadi efek samping yang dapat timbul dari partisipasi anda, sehingga kami tidak menyediakan asuransi untuk penelitian ini.

14. Peneliti yang bertanggung jawab untuk penelitian ini:

Penelitian ini telah ditinjau dan disetujui oleh Komite Etik Fakultas Kedokteran Gigi Universitas Indonesia.

Jika anda memiliki pertanyaan pada saat kapanpun tentang penelitian ini atau prosedur yang dilakukan, anda dapat menghubungi saya melalui alamat email berikut ini:
Marisza Hijryana
Email:

Jika anda memiliki pertanyaan setelah membaca lembar informasi ini, silahkan jangan ragu bertanya kepada saya.

Anda akan diberikan salinan dari lembar informasi ini dan salinan lembar persetujuan yang telah anda tandatangani untuk anda simpan jika anda ingin berpartisipasi dalam studi ini.

Terimakasih atas bantuan anda!

Lembar Persetujuan (1)

Persetujuan untuk mengisi kuesioner dan mendapatkan pemeriksaan kesehatan gigi-mulut.

Silahkan mencentang kotak dibawah ini

1. Saya menyatakan bahwa saya telah membaca dan memahami lembar informasi untuk studi di atas. ☐
2. Saya telah memiliki kesempatan untuk mempertimbangkan informasi, mengajukan pertanyaan dan telah mendapatkan jawaban yang memuaskan. ☐
3. Saya setuju untuk mengambil bagian dalam studi di atas. Saya memahami bahwa keikutsertaan saya bersifat sukarela dan saya bebas untuk menarik diri setiap saat. ☐
4. a) Saya setuju untuk mengisi kuesioner untuk penelitian yang disebutkan diatas. ☐
   b) Saya setuju untuk mendapatkan pemeriksaan gigi-mulut untuk penelitian yang telah dijelaskan diatas. ☐
5. Saya setuju bahwa data dari pemeriksaan gigi-mulut dan pengisian kuesioner, dan data lainnya yang diperoleh dari hal tersebut dapat disimpan dengan aman selama 10 tahun pasca selesainya studi S3 peneliti. ☐
6. Saya setuju bahwa informasi dari pemeriksaan gigi-mulut, kuesioner dan analisis yang diambil dari hal tersebut dapat digunakan untuk tujuan penelitian (tesis S3, presentasi, dan artikel penelitian). ☐
7. Saya memahami bahwa saya tidak akan dapat diidentifikasi di semua karya tulis penelitian tersebut. ☐

_____	_____	_____
Nama peserta	Tanggal	Tanda tangan

_____	_____	_____
Peneliti	Tanggal	Tanda tangan

Appendix 3.5 Infomed consent form for the qualitative data collection in English

Informed Consent Statement (2)

Information leaflet and consent for participants having interview session.

Study title:	Periodontal diseases and oral health related quality of life in the urban older population
Supervisor:	1. Professor Angus Walls (Principal Supervisor) 2. Dr. Margaret MacDougall (Second Supervisor)
PhD student:	Marisza Hijryana

You are being invited to take part in the second session of this research study. Before you decide whether or not to take part, it is important for you to understand what kind of research is being done and what it will involve. Please take your time to read the following information carefully.

Thank you for reading this.

1. Research title:
Periodontal Diseases and Oral Health Related Quality of Life in the Urban Older Population

2. Research information:
This study is a PhD research. The research topic is about oral and periodontal disease in the ageing Indonesian population.

3. Research aims:
To investigate the relationship between oral health-related quality of life and periodontal disease in the ageing population in Depok (Indonesia).

4. Reason why you are considered fit to be the subject of this research:

- You should be native Indonesian adults of age 50 years old and above currently living in Depok.
- You should be willing and able to participate in the interview session for this study.
- You should be able to provide consent.

5. Estimated number of subjects involved in this research:

Up to 30 subjects

6. Procedures / research procedures:

- Firstly, you have to read this information leaflet carefully. If you agree to contribute to the study, then you should complete and sign the consent form.
- Secondly, you will be interviewed by the researcher. Your interview will take form a series of questions about oral health problems, health facilities, and behavior related to oral health. The interview last at different amount of time with different people but commonly last between 30 minutes to an hour. We would like to record your opinions at the interview so that we could fully listen to you.
- After your participation in this interview session, your involvement in the study is over. We appreciate your contribution in this study.

7. Risks and discomfort:

There are no known risks to participation in this study. It is considered unlikely that there will be adverse events arising from participation in this study. However, it is possible and the oral health issues during interview session may upset participants. The researchers who will undertake the oral examination have experience in delivering oral health education, care, and treatment for patients with oral health problems, and therefore has experience in dealing with sensitive issues associated with oral health problems. In addition to this, the appropriateness and effectivity of the questions in the interview topic guide have been tested in the pilot prior to research data collection in Indonesia.

8. Immediate benefit for subject:

Involvement in this study means you are making contribution to the knowledge about oral health and quality of life issues.

9. Confidentiality of research data:

Your participation in this study will be kept confidential in any published work. No personal details that might identify you will be stored with your interview data which will be anonymized. We will take care to make sure that your identity can not be ascertained from any discussion of interview findings or quotes from the interview transcript.

10. Compensation or reward:

For participation in this study you will receive Rp. 80.000 and sustenance (foods and drinks with nominal Rp.20.000) in recognition of the time involved in this project.

11. Volunteerism in research:
Your participation is voluntary. You could freely decide whether you would like to participate or not participate in this study. We will give you plenty of time to consider your decision.

12. Subject may withdraw / excluded from the study:
You may withdraw from the study at any time and for any reason. If you withdraw from the study, you will not be asked to return any benefit that you already received and there is no consequences for this.

Please note that unless I hear from you to the contrary, I will assume that you are agreeable to me using any data and feedback you may submit by means of the recording from interview even if you advise me at a later stage that you wish to withdraw from the research.

13. Researcher's responsibility for any complain regarding the study:
It is very unlikely that there will be adverse events arising from your participation as an interviewee in this study, so we are not provide any insurance for this study.

14. Researcher who responsible for this research:
This project has been reviewed and approved by the Ethics Committee, faculty of Dentistry University of Indonesia.

If you have any concerns or questions at any time about the study or procedures, you may contact this email address:
Marisza Hijryana
Email:

You may have some questions after you have read this information sheet. Please feel free to ask, to clear up any queries that you may have.

You will be given a copy of this information sheet and also a copy of the signed consent form to keep if you would like to participate in this study. **Thank you for your help!**

Consent Form (2)

Consent for participants having interview session.

Please tick the box

1. I confirm that I have read and understand the information sheet for the above study. ☐
2. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
3. I agree to take part in the above study. I understand that my participation is voluntary and that I am free to withdraw at any time. ☐
4. I consent to having an interview session for the research project identified above. I understand that the interview will involve audio recording of my opinions and they will be transcribed. ☐
5. I agree that the recording from interview and any data derived from them may be kept securely for the duration of 10 years post completion PhD study. ☐
6. I agree that the recording from interview and any analyses drawn from them may be used for research purposes (PhD thesis, presentations, and research articles). ☐
7. I understand that I will not be identifiable in any of the reporting/quotes in all of those research written works. ☐

_____	_____	_____
Name of participant	Date	Signature

_____	_____	_____
Researcher	Date	Signature

Appendix 3.6 Infomed consent form for the qualitative data collection in Indonesian

Informed Consent (2)

Lembar informasi dan persetujuan untuk peserta yang akan berpatisipasi dalam wawancara.

Judul penelitian:	Penyakit Periodontal dan Kesehatan Gigi dan Mulut yang Berkaitan dengan Kualitas Hidup pada Populasi Masyarakat Perkotaan Usia Tua
Pembimbing:	1. Professor Angus Walls (Pembimbing Utama) 2. Dr. Margaret MacDougall (Pembimbing Kedua)
Mahasiswi S3 (PhD):	Drg. Marisza Hijryana., MPH

Anda diundang untuk berpartisipasi dalam penelitian ini. Sebelum anda memutuskan untuk berpartisipasi atau tidak, penting bagi anda untuk memahami penelitian yang akan dilakukan dan apa saja yang akan dilakukan. Silahkan luangkan waktu anda untuk membaca informasi berikut ini dengan seksama.

Terimakasih telah membaca informasi ini.

1. Judul penelitian:
Penyakit Periodontal dan Kesehatan Gigi dan Mulut yang Berkaitan dengan Kualitas Hidup pada Populasi Masyarakat Perkotaan Usia Tua

2. Informasi mengenai penelitian:
Penelitian ini adalah penelitian studi S3. Topik penelitian mengenai kesehatan gigi-mulut dan jaringan pendukungnya pada masyarakat berusia tua di Indonesia.

3. Tujuan penelitian:
Untuk mengetahui hubungan antara kualitas hidup dan penyakit gigi mulut dan jaringan pendukungnya pada masyarakat berusia tua di kota Depok.

4. Anda akan dapat berpartisipasi sebagai peserta penelitian apabila memenuhi persyaratan berikut ini:

- Peserta adalah penduduk asli Indonesia berusia 50 tahun dan keatas yang saat ini tinggal pada wilayah kota Depok.

- Peserta bersedia untuk berpartisipasi pada pengisian kuesioner dan pemeriksaan kesehatan gigi-mulut.
- Peserta bersedia untuk memberikan persetujuan berpartisipasi.

5. Estimasi peserta yang akan terlibat pada penelitian ini:
Sampai dengan 30 peserta.

6. Tahapan penelitian:

- Pertama, anda dapat membaca lembaran informasi ini dengan sebaik-baiknya. Jika anda setuju untuk berpartisipasi, anda dapat mengisi dan menandatangani formulir persetujuan.
- Kedua, anda akan diwawancara oleh peneliti. Wawancara anda adalah mengenai masalah gigi-mulut, fasilitas kesehatan, dan kebiasaan yang berhubungan dengan kesehatan gigi-mulut. Wawancara ini berlangsung antara 30 menit sampai dengan satu 1 jam. Kami akan merekam wawancara ini sehingga kami dapat sepenuhnya mendengarkan anda.
- Setelah partisipasi anda dalam wawancara, keterlibatan anda dalam penelitian ini telah selesai. Kami sangat menghargai partisipasi anda dalam penelitian ini.

7. Resiko dan ketidaknyamanan
Tidak ada risiko yang diketahui dari berpartisipasi dalam penelitian ini. Studi ini telah melalui pertimbangan sehingga dianggap tidak ada efek samping yang memungkinkan dari berpartisipasi dalam penelitian ini. Namun, mungkin saja topik mengenai kesehatan gigi-mulut dapat menimbulkan sedikit ketidaknyamanan. Peneliti yang akan melakukan wawancara ini memiliki pengalaman dalam memberikan pendidikan kesehatan gigi-mulut, perawatan dan pengobatan pasien yang memiliki masalah gigi-mulut sehingga memiliki pengalaman dalam menghadapi permasalahan sensitif yang berkaitan dengan kesehatan gigi-mulut. Selanjutnya, kepantasan dan efektifitas pertanyaan wawancara telah diujicoba dalam pilot studi sebelum pengumpulan data penelitian ini.

8. Manfaat langsung dari berpartisipasi pada penelitian ini:
Anda berkontribusi pada pengetahuan tentang masalah kesehatan gigi-mulut dan kualitas kehidupan.

9. Kerahasian data penelitian (*confidentiality*):
Partisipasi anda dalam penelitian ini akan dijaga kerahasiaannya dalam setiap karya tulis. Tidak ada informasi pribadi yang dapat mengidentifikasi anda yang akan disimpan bersama data wawancara yang akan di anonimkan. Kami akan

memastikan bahwa anda tidak akan dapat diidentifikasi dari hasil temuan atau kutipan dari transkrip wawancara.

10. Kompensasi atau hadiah

Anda akan menerima uang sebesar Rp. 80.000 dan paket makanan box (berisi makanan dan minuman senilai Rp.20.000) untuk waktu yang anda luangkan dalam penelitian ini.

11. Kesukarelaan dalam penelitian

Partisipasi anda bersifat sukarela. Anda bisa dengan leluasa memutuskan apakah ingin berpartisipasi atau tidak berpartisipasi dalam penelitian ini.

12. Peserta dapat menarik diri dari penelitian:

Anda dapat menarik diri kapan saja dan untuk alasan apapun dari penelitian ini. Jika anda menarik diri dari penelitian ini, anda tidak akan diminta untuk mengembalikan keuntungan yang telah anda terima sebelumnya.

Harap diperhatikan bahwa kecuali saya mendengar dari anda sebaliknya, saya akan berasumsi anda setuju untuk saya menggunakan data rekaman wawancara bahkan jika anda memberi tahu saya pada tahap selanjutnya bahwa anda ingin menarik diri dari penelitian.

13. Tanggung jawab peneliti apabila ada keluhan dari penelitian ini:

Sangat tidak memungkinan terjadi efek samping yang dapat timbul dari partisipasi anda dalam wawancara ini, sehingga kami tidak menyediakan asuransi untuk penelitian ini.

14. Peneliti yang bertanggung jawab untuk penelitian ini:

Penelitian ini telah ditinjau dan disetujui oleh Komite Etik Fakultas Kedokteran Gigi Universitas Indonesia.

Jika anda memiliki pertanyaan pada saat kapanpun tentang penelitian ini atau prosedur yang dilakukan, anda dapat menghubungi saya melalui alamat email berikut ini:

Marisza Hijryana
Email:

Jika anda memiliki pertanyaan setelah membaca lembar informasi ini, silahkan jangan ragu bertanya kepada saya.

Anda akan diberikan salinan dari lembar informasi ini dan salinan lembar persetujuan yang telah anda tandatangani untuk anda simpan jika anda ingin berpartisipasi dalam studi ini. **Terimakasih atas bantuan anda!**

Lembar Persetujuan (2)
Persetujuan untuk melakukan wawancara.

Silahkan mencentang kotak dibawah ini

1. Saya menyatakan bahwa saya telah membaca dan memahami lembar informasi untuk studi di atas. ☐
2. Saya telah memiliki kesempatan untuk mempertimbangkan informasi, mengajukan pertanyaan dan telah mendapatkan jawaban yang memuaskan. ☐
3. Saya setuju untuk mengambil bagian dalam studi di atas. Saya memahami bahwa keikutsertaan saya bersifat sukarela dan saya bebas untuk menarik diri setiap saat. ☐
4. Saya setuju untuk melakukan wawancara untuk penelitian yang disebutkan diatas. Saya memahami bahwa wawancara akan direkam dan akan ditranskrip. ☐
5. Saya setuju bahwa data dari pemeriksaan gigi-mulut dan pengisian kuesioner, dan data lainnya yang diperoleh dari hal tersebut dapat disimpan dengan aman selama 10 tahun pasca selesainya studi S3 peneliti. ☐
6. Saya setuju bahwa hasil rekaman wawancara dan analisis yang diambil dari hal tersebut dapat digunakan untuk tujuan penelitian (tesis S3, presentasi, dan artikel penelitian). ☐
7. Saya memahami bahwa saya tidak akan dapat diidentifikasi dari hasil laporan/kutipan pada semua karya tulis penelitian tersebut. ☐

_____	_____	_____
Nama peserta	Tanggal	Tanda tangan

_____	_____	_____
Peneliti	Tanggal	Tanda tangan

Appendix 3.7 Questionnaire in English

QUESTIONNAIRE ON DETERMINANTS OF ORAL HEALTH RELATED QUALITY OF LIFE

IDENTIFICATION :

Study number : Gender: Man / Woman

Date of Birth (DOB) :

Administration city : District:

Date of questionnaire :

Time of questionnaire :

BACKGROUND INFORMATION

1. How old are you? ____ years old

2. What is your formal educational background?

   a. Never attended formal school
   b. Not completed elementary school
   c. Elementary school
   d. Junior high school
   e. High school/ vocational school
   f. College/ University

3. What is your marital status?

   a. Single
   b. Married
   c. Divorce/ Separated
   d. Widowed

4. What is your current job status?

   a. Working for government or public sector
   b. Working for private sector
   c. Self-employed
   d. Unemployed
   e. Retired
   f. Others (please specify):_____

5. Which kinds of income do you personally receive?

   a. Earnings from employment
   b. Pension from former employer
   c. State pension
   d. Interest from savings / investments
   e. Earnings from spouse (for example: husband/wife)
   f. Other, please specify_____

6. Could you please estimate your monthly household income?

   a. Less than Rp. Rp.1.000.000
   b. Rp.1.000.000 – 3.500.000
   c. Rp.3.500.001 – 5.000.000
   d. More than Rp.5.000.000

7. How many people live in your household? _____

SMOKING AND TOBACCO USE

8. Which of the statements matches your experience of smoking a cigarette/ a cigar/ a pipe/ chewing tobacco?

    a. I smoke nowadays
    b. I chew tobacco nowadays
    c. I am a former smoker/tobacco chewer
    d. I have never smoked or chewing tobacco → Go to Question 13

9. How long have you been smoking/ chewing tobacco? / How long had you been smoking/ chewing tobacco?

    a. Less than 5 years
    b. 5-10 years
    c. More than 10 years

10. How many cigarettes do you smoke per day? / How many cigarettes you used to smoke per day?

    a. Less than 10 cigarettes/ day
    b. 10-19 cigarettes/ day
    c. More than 19 cigarettes/day
    d. I have never smoked, but I have chewed tobacco

11. How many grams of tobacco do you chew per day? / How many grams of tobacco you used to chew per day?

    a. Up to 5 grams
    b. More than 5 grams
    c. I have never chewed tobacco, but I have smoked

12. How long have you stopped smoking/ chewing tobacco?

    a. Less than 5 years
    b. 5-10 years
    c. More than 10 years
    d. I am still smoking/chewing tobacco

DIABETES STATUS

13. What is your current diabetes status?

    a. **No diabetes → Go to Question 17**
    b. Diabetes type 1 (Insulin dependent diabetes mellitus (IDDM))
    c. Diabetes type 2 (Non-insulin dependent diabetes mellitus (NIDDM))
    d. Diabetes, but I don't know which type of diabetes I have suffered

14. How old were you when first diagnosed with diabetes?

    a. Less than 40 years old
    b. 40 years old and above

15. What kind of therapy do you receive for your diabetes management? (you may choose multiple option)

    a. Insulin injection
    b. Oral hypoglycaemic agent and other oral medications
    c. Controlled diet
    d. Regular exercise
    e. Smoking cessation
    f. Other (please specify):_____

16. How long have you had diabetes?

    a. Less than 5 years
    b. 5-10 years
    c. More than 10 years

CURRENT ORAL HEALTH BEHAVIOUR

17. How often do you brush your teeth nowadays?

    a. More than twice a day
    b. Twice a day
    c. Once a day
    d. Less than once a day

18. Do you use any of the following to clean your teeth? (you may choose multiple options)

    a. Toothbrush
    b. Dental floss
    c. Interdental brush/toothpicks/wood sticks
    d. Mouthwash
    e. Electric toothbrush
    f. Denture cleaning solution (if you have denture)
    g. Sugar-free chewing gum
    h. Other (please specify): _____

19. If you have a denture, how often do you clean your dentures nowadays? (Question refers to all types of cleaning)

    a. More than twice a day
    b. Twice a day
    c. Once a day
    d. Less than once a day
    e. I don't have denture

PATTERN OF DENTAL ATTENDANCE

20. How often do you go to a dentist?

    a. At least once every six months
    b. At least once every year
    c. Only when having trouble with teeth/dentures
    d. Never been to dentist

GENERAL / ORAL HEALTH

21. How is your **HEALTH IN GENERAL**; would you say it is…

    a. Very good
    b. Good
    c. Fair
    d. Bad
    e. Very bad

22. (And) would you say your **DENTAL HEALTH** (mouth, teeth and/or dentures) is...

a. Very good
b. Good
c. Fair
d. Bad
e. Very bad

ORAL HEALTH IMPACT PROFILE

(How often have you had the problem during the last year?)

23. Have you experienced difficulty chewing any food because of problems with your teeth, mouth or dentures?

a. Very often
b. Fairly often
c. Occasionally
d. Hardly ever
e. Never
f. Don't know

24. Have you felt problems related to your teeth, mouth or dentures cause bad breath?

a. Very often
b. Fairly often
c. Occasionally
d. Hardly ever
e. Never
f. Don't know

25. Have you experienced discomfort eating any food because of problems with your teeth, mouth or dentures?

a. Very often
b. Fairly often
c. Occasionally
d. Hardly ever
e. Never
f. Don't know

26. Have you experienced ulcers in your mouth?

    a. Very often
    b. Fairly often
    c. Occasionally
    d. Hardly ever
    e. Never
    f. Don’t know

27. Have you felt discomfort due to food getting stuck in between your teeth or dentures?

    a. Very often
    b. Fairly often
    c. Occasionally
    d. Hardly ever
    e. Never
    f. Don’t know

28. Have you felt shy because of problems with your teeth, mouth or dentures?

    a. Very often
    b. Fairly often
    c. Occasionally
    d. Hardly ever
    e. Never
    f. Don’t know

29. Have you avoided eating certain foods because of problems with your teeth, mouth or dentures?

    a. Very often
    b. Fairly often
    c. Occasionally
    d. Hardly ever
    e. Never
    f. Don’t know

30. Have you avoided smiling because of problems with your teeth, mouth or dentures?

    a. Very often
    b. Fairly often
    c. Occasionally
    d. Hardly ever
    e. Never
    f. Don’t know

31. Has your sleep been disturbed because of problems with your teeth, mouth or dentures?

    a. Very often
    b. Fairly often
    c. Occasionally
    d. Hardly ever
    e. Never
    f. Don’t know

32. Has your concentration been disturbed by problems with your teeth, mouth or dentures?

    a. Very often
    b. Fairly often
    c. Occasionally
    d. Hardly ever
    e. Never
    f. Don’t know

33. Have you avoided going out because of problems with your teeth, mouth or dentures?

    a. Very often
    b. Fairly often
    c. Occasionally
    d. Hardly ever
    e. Never
    f. Don’t know

34. Have you experienced problems in carrying out your daily activities because of problems with your teeth, mouth or dentures?

a. Very often
b. Fairly often
c. Occasionally
d. Hardly ever
e. Never
f. Don’t know

35. Have you had to spend a lot of money due to problems with your teeth, mouth or dentures?

a. Very often
b. Fairly often
c. Occasionally
d. Hardly ever
e. Never
f. Don’t know

36. Have you felt less confident of yourself due to problems with your teeth, mouth or dentures?

a. Very often
b. Fairly often
c. Occasionally
d. Hardly ever
e. Never
f. Don’t know

Thank you for answering.

Appendix 3.8 Questionnaire in Indonesian

KUESIONER MENGENAI PENENTU KESEHATAN GIGI DAN MULUT YANG BERKAITAN DENGAN KUALITAS HIDUP

IDENTITAS:

Nomer Studi : Jenis Kelamin: Laki-laki/ Wanita

Tanggal Lahir (TTL) :

Kota : Depok Kecamatan:

Tanggal pengisian kuesioner :

Waktu pengisian kuesioner :

INFORMASI MENGENAI LATAR BELAKANG

1. Berapa usia anda? ____ tahun

2. Apa latar belakang pendidikan formal anda?
    a. Tidak pernah bersekolah
    b. Tidak lulus Sekolah Dasar (SD)
    c. Sekolah Dasar (SD)
    d. Sekolah Menegah Pertama (SMP)
    e. Sekolah Menegah Atas (SMA)/ Sekolah Menengah Kejuruan (SMK)
    f. Universitas

3. Apa status pernikahan anda?
    a. Single
    b. Menikah
    c. Bercerai/berpisah
    d. Duda/Janda karena pasangan telah meninggal

4. Apa status pekerjaan anda saat ini?
    a. Karyawan pemerintah atau sektor publik
    b. Karyawan swasta
    c. Bekerja untuk diri sendiri
    d. Tidak bekerja
    e. Pensiunan
    f. Lainnya (sebutkan):_____

5. Apa jenis pendapatan yang anda terima saat ini?
    a. Pendapatan dari bekerja
    b. Pensiun dari tempat dulu bekerja
    c. Pensiun dari negara
    d. Bunga dari tabungan/ investasi
    e. Pendapatan dari pasangan (contoh: suami/istri)
    f. Lainnya,
    (sebutkan):_____

6. Dapatkah anda estimasi perkiraan pendapatan bulanan rumah tangga anda?
    a. Kurang dari Rp. Rp.1.000.000
    b. Rp.1.000.000 – 3.500.000
    c. Rp.3.500.001 – 5.000.000
    d. Lebih dari Rp.5.000.000

7. Berapa orang yang tinggal dalam rumah tangga anda? _____

MEROKOK DAN PENGGUNAAN TEMBAKAU

8. Manakah dari pernyataan ini yang sesuai dengan pengalaman anda dalam merokok rokok filter/ cerutu/ rokok pipa/ mengunyah tembakau?
    a. Saya merupakan perokok aktif saat ini
    b. Saya merupakan pengunyah tembakau aktif saat ini
    c. Saya merupakan mantan perokok/ pengunyah tembakau di waktu yang lalu
    d. Saya tidak pernah merokok ataupun mengunyah tembakau → Menuju ke Pertanyaan Nomer 13

9. Berapa lama anda telah merokok/ mengunyah tembakau? / Berapa lama anda dulu pernah merokok/ mengunyah tembakau?
    a. Kurang dari 5 tahun
    b. 5-10 tahun
    c. Lebih dari 10 tahun

10. Berapa banyak rokok yang anda hisap per hari? / Berapa banyak rokok yang anda biasa hisap dulu waktu anda merokok per hari?
    a. Kurang dari 10 rokok/ hari
    b. 10-19 rokok/ hari
    c. Lebih dari 19 rokok / hari
    d. Saya tidak pernah merokok, tetapi saya mengunyah tembakau

11. Berapa gram tembakau yang anda kunyah per hari? / Berapa gram tembakau yang anda biasa kunyah dulu waktu anda mengunyah tembakau per hari?
    a. Sampai dengan 5 gram
    b. Lebih dari 5 gram
    c. Saya tidak pernah mengunyah tembakau, tetapi saya merokok

12. Berapa lama anda telah berhenti merokok/ mengunyah tembakau?
    a. Kurang dari 5 tahun
    b. 5-10 tahun
    c. Lebih dari 10 tahun
    d. Saya masih merokok/ mengunyah tembakau

DIABETES STATUS

13. Apa status penyakit diabetes anda saat ini?
    a. Tidak diabetes → Menuju ke pertanyaan nomer 17
    b. Diabetes tipe 1 (diabetes mellitus bergantung insulin)
    c. Diabetes tipe 2 (diabetes mellitus tidak tergantung insulin)
    d. Diabetes, tetapi saya tidak tahu tipe apa diabetes yang saya derita

14. Berapa usia anda ketika pertama kali didiagnosa diabetes?
    a. Kurang dari 40 tahun
    b. 40 tahun dan 40 tahun keatas

15. Apa jenis pengobatan yang anda terima untuk mengatasi diabetes anda?

    (Anda dapat memilih lebih dari satu opsi pilihan berikut ini)

    a. Suntikan insulin
    b. *Oral hypoglycaemic agent* dan obat-obatan oral lainnya
    c. Kontrol makanan
    d. Olahraga teratur
    e. Berhenti merokok
    f. Lainnya (sebutkan): _____

16. Berapa lama anda telah menderita diabetes?
    a. Kurang dari 5 tahun
    b. 5-10 tahun
    c. Lebih dari 10 tahun

PERILAKU KESEHATAN GIGI DAN MULUT SAAT INI

17. Seberapa sering anda menyikat gigi saat ini?
    a. Lebih dari dua kali sehari
    b. Dua kali sehari
    c. Satu kali sehari
    d. Kurang dari satu kali sehari

18. Apakah anda menggunakan dari pilihan berikut untuk membersihkan gigi anda? (Anda dapat memilih lebih dari satu opsi pilihan berikut ini)
    a. Sikat gigi
    b. Benang gigi
    c. Sikat interdental/tusuk gigi/ tusuk gigi kayu
    d. Obat kumur
    e. Sikat gigi elektronik
    f. Cairan pembersih gigi tiruan (jika anda memiliki gigi tiruan)
    g. Permen karet bebas gula
    h. Lainnya (tolong sebutkan): _____

19. Jika anda memiliki gigi tiruan, berapa sering anda membersihkan gigi tiruan anda saat ini? (Pertanyaan mengacu pada semua jenis pembersihan gigi tiruan)
    a. Lebih dari dua kali sehari
    b. Dua kali sehari
    c. Satu kali sehari
    d. Kurang dari satu kali sehari
    e. Saya tidak memiliki gigi tiruan

POLA KEHADIRAN KE DOKTER GIGI

20. Seberapa sering anda pergi ke dokter gigi?
    a. Setidaknya 1 kali dalam 6 bulan
    b. Setidaknya 1 kali dalam 1 tahun
    c. Hanya ketika memiliki masalah dengan gigi dan mulut / gigi tiruan
    d. Tidak pernah ke dokter gigi

KESEHATAN UMUM, GIGI DAN MULUT

21. Bagaimana KESEHATAN anda secara UMUM; menurut anda kesehatan umum anda dapat dikatakan…
    a. Sangat baik
    b. Baik
    c. Sedang
    d. Buruk
    e. Sangat buruk

22. (Dan) menurut anda KESEHATAN GIGI DAN MULUT anda (mulut, gigi dan/atau gigi tiruan anda) dapat dikatakan…
    a. Sangat baik
    b. Baik
    c. Sedang
    d. Buruk
    e. Sangat buruk

PROFIL DAMPAK KESEHATAN MULUT

(Seberapa sering anda mengalami masalah yang disebutkan ini sepanjang setahun terakhir)

23. Pernahkah Anda mengalami kesulitan mengunyah makanan karena masalah gigi, mulut atau gigi tiruan?

    a. Sangat sering
    b. Sering
    c. Kadang-kadang
    d. Sesekali
    e. Tidak pernah
    f. Tidak tahu

24. Apakah Anda merasa masalah gigi, mulut, atau gigi tiruan Anda menyebabkan nafas anda berbau?

    a. Sangat sering
    b. Sering
    c. Kadang-kadang
    d. Sesekali
    e. Tidak pernah
    f. Tidak tahu

25. Apakah Anda pernah mengalami rasa tidak nyaman untuk makan karena masalah gigi, mulut atau gigi tiruan Anda?

    a. Sangat sering
    b. Sering
    c. Kadang-kadang
    d. Sesekali
    e. Tidak pernah
    f. Tidak tahu

26. Pernahkah Anda mengalami bintik-bintik putih dan iritasi (sariawan) di dalam mulut?

    a. Sangat sering
    b. Sering
    c. Kadang-kadang
    d. Sesekali
    e. Tidak pernah
    f. Tidak tahu

27. Pernahkah Anda merasa tidak nyaman karena makanan yang tersangkut di antara gigi atau gigi tiruan Anda?

    a. Sangat sering
    b. Sering
    c. Kadang-kadang
    d. Sesekali
    e. Tidak pernah
    f. Tidak tahu

28. Pernahkan anda merasa malu karena masalah gigi, mulut atau gigi tiruan Anda?

    a. Sangat sering
    b. Sering
    c. Kadang-kadang
    d. Sesekali
    e. Tidak pernah
    f. Tidak tahu

29. Pernahkah anda menghindari untuk mengkonsumsi makanan tertentu karena masalah gigi, mulut atau gigi tiruan Anda?

    a. Sangat sering
    b. Sering
    c. Kadang-kadang
    d. Sesekali
    e. Tidak pernah
    f. Tidak tahu

30. Pernahkah anda menghindari untuk tersenyum karena masalah gigi, mulut atau gigi tiruan Anda?

    a. Sangat sering
    b. Sering
    c. Kadang-kadang
    d. Sesekali
    e. Tidak pernah
    f. Tidak tahu

31. Pernahkah tidur anda terganggu karena masalah gigi, mulut atau gigi tiruan anda?

    a. Sangat sering
    b. Sering
    c. Kadang-kadang
    d. Sesekali
    e. Tidak pernah
    f. Tidak tahu

32. Pernahkah konsentrasi anda terganggu karena masalah gigi, mulut dan gigi tiruan anda?

    a. Sangat sering
    b. Sering
    c. Kadang-kadang
    d. Sesekali
    e. Tidak pernah
    f. Tidak tahu

33. Pernahkah anda menghindari untuk keluar berjalan-jalan disebabkan masalah gigi, mulut atau gigitiruan anda?

    a. Sangat sering
    b. Sering
    c. Kadang-kadang
    d. Sesekali
    e. Tidak pernah
    f. Tidak tahu

34. Pernahkah Anda mengalami kesukaran untuk melakukan kerja harian Anda karena masalah gigi, mulut atau gigi tiruan Anda?

a. Sangat sering
b. Sering
c. Kadang-kadang
d. Sesekali
e. Tidak pernah
f. Tidak tahu

35. Pernahkah anda harus mengeluarkan biaya yang tinggi disebabkan masalah gigi, mulut atau gigi tiruan anda?

a. Sangat sering
b. Sering
c. Kadang-kadang
d. Sesekali
e. Tidak pernah
f. Tidak tahu

36. Pernahkah Anda merasa kurang percaya diri karena masalah gigi, mulut atau gigi tiruan Anda?

a. Sangat sering
b. Sering
c. Kadang-kadang
d. Sesekali
e. Tidak pernah
f. Tidak tahu

Terimakasih atas jawaban anda

Appendix 3.9 Oral health examination form

Oral Health Examination Charts

IDENTIFICATION :

Study number : Gender: Man / Woman

Date of Birth (DOB) :

Administration city : District:

Date of oral health examination :

Time of the oral health examination :

Name of the dental health professional :

I. Intraoral Examination

Teeth record condition.

Teeth	18	17	16	15	14	13	12	11	2	22	23	24	25	26	27	28
Condition																
Teeth	48	47	46	45	44	43	42	41	3	32	33	34	35	36	37	38

Codes for teeth condition

Codes	Teeth condition
0	Healthy/ Sound
1	Decayed
2	Filled, with decay
3	Filled, no decay
4	Missing, as a result of caries
5	Missing, any other reason
6	Fissure sealant
7	Bridge abutment, special crown or veneer/implant
8	Un-erupted tooth
T	Trauma (fracture)
9	Not recorded

II. Oral Hygiene Examination

The Simplified Oral Hygiene Index (OHI-S) has two component measurement plaque (Debris Index) and calculus (Calculus Index).

a. Plaque

	Right molar		Anterior incisor		Left molar		Total	
	Buccal	Lingual	Labial	Labial	Buccal	Lingual	Buccal/Labial	Lingual
Upper		-		-		-		-
Lower	-		-		-			

Scores for plaque assessment (Greene and Vermillion, 1964, Broadbent et al., 2011)

Scores	Criteria for classifying debris
0	No debris or stain present
1	Soft debris covering not more than one-third of the tooth surface, or presence of extrinsic stains without other debris regardless of surface area covered
2	Soft debris covering more than one-third, but not more than two-thirds, of the exposed tooth surface
3	Soft debris covering more than two-thirds of the exposed tooth surface

b. Calculus

	Right molar		Anterior incisor		Left molar		Total	
	Buccal	Lingual	Labial	Labial	Buccal	Lingual	Buccal/Labial	Lingual
Upper		-		-		-		-
Lower	-		-		-			

Scores for calculus assessment (Broadbent et al., 2011, Greene and Vermillion, 1964)

Scores	Criteria for classifying calculus
0	No calculus present
1	Supragingival calculus covering not more than third of the exposed tooth surface.
2	Supragingival calculus covering more than one third but not more than two thirds of the exposed tooth surface or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both.
3	Supragingival calculus covering more than two third of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth or both.

III. Periodontal Examination

All the teeth probing scores is recorded to assess periodontal condition

Teeth	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
BPE score																
Mobility																
BPE score																
Mobility																
Teeth	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

Scores for periodontal condition.

Scores	Criteria for periodontal condition
0	No pockets >3.5 mm, no calculus/overhangs, no bleeding after probing (black band completely visible)
1	No pockets >3.5 mm, no calculus/overhangs, but bleeding after probing (black band completely visible)
2	No pockets >3.5 mm, but supra or sub gingival calculus/overhangs (black band completely visible)
3	Probing depth 3.5 -5.4 mm
4	Probing depth 5.5 - 8.4 mm
5	Probing depth 8.5-11.5 mm
6	Probing depth > 11.5 mm
*	Furcation involvement

Appendix 3.10 Interview Topic Guide in English

Topic Guide for Interview in:
Periodontal Disease and Oral Health Related Quality of Life

1. Introduction	
	1.1 Information about study
Information	• This study is looking at oral health and well-being. • We are conducting questionnaire survey and talking to Indonesian people living in Depok to understand their oral health experience. • Today I would like to speak to you about your oral health problems experience, treatment and services you have used. • I would like to audio-record the interview today so that I could fully listen to your experience. • Any information that you share with me will be kept confidential. You will not be identifiable from anything we write after interviewing and collecting questionnaire data from you.
	1.2 Informed Consent and pre-interview section
Instruction Action Question Instruction	• If you are happy with this, please have a read over the information sheet and consent form. • Give information sheet and informed consent form • Do you have any questions before we start the interview? • Please let me know at any point if you want to stop or take a break
	1.3 Start the Interview
Action Statement Question	• Turn on audio recorder • Thank you for agreeing to speak to me, be interviewed, and gave your consent as a participant in this research. • Could you please tell me a bit about yourself? It could be anything that you would like to share with me, such as your daily activities, etc.

2. Information and knowledge regarding oral health
2.1. Oral health awareness
• Main Question: I would like to know what you think about general health? And what do you think about oral health? • Prompt: What does oral health mean to you? • Probes: - Relation between oral health and general health - Tooth decay, tooth loss, etc. - Quality of life - Others
2.2. Oral health maintenance
• Main Question: Could you please tell me about what do you do to take care of your mouth? • Prompt: Do you need someone to help you taking care of your daily oral health? • Probes: - Brushing, flossing, mouthwash, other tools to clean teeth and gums - Sugary food and drink - Smoking habit - Balanced diet (vegetables, fruits, starchy foods (e.g. rice, potato, bread), protein, milk and dairy foods) - Frequency of brushing/ flossing/using mouthwash - Regular dental check-ups - Others
2.3. Source of oral/dental health information
• Main Question: Where do you usually get information about oral health? • Prompt: Do you feel that you have received enough information about it? • Probes: - Dentist/ dental nurse/ health staff - Television, radio, magazines, leaflet - Family and friends - Others
2.4. Influence or advice from family/ friends/ colleague
• Main Question: I would like you to tell me what you think about your family/ friend/ colleague attitude toward oral health. • Prompt: Have you ever discuss your oral health problems with your family or friends? • Probes: - Recommendations about how to maintain oral health - Suggestions regarding dentist/ health facilities - Others

3. Experience of oral/ dental problems

3.1. Oral health diseases experience

- Main Question: Could you please tell me about your experience with dental or gum disease?
- Prompts: How would you describe your experience with dental or gum problems?
- Probes:
  - Soreness/ painful aching
  - Bad breath
  - Dry mouth
  - Trouble in pronouncing any words
  - Interference in the sense of taste
  - Uncomfortable to eat/ interrupt meals
  - Daily activities disrupted/ difficulties in performing daily activities
  - Self-conscious, embarrassed
  - Felt tense, difficult to rest
  - Unable to function
  - Others

3.2. Triggers to search for care/ treatment

- Main Question: What circumstances make you think that you have a dental/ gum problems?
- Prompts: What did you do to overcome the pain or uncomfortable feelings from dental/ gum problems? What if the symptoms continue and get worse?
- Probes:
  - Intermittent/ continuous/ severe pain
  - Gum bleeding
  - Pus
  - Swollen
  - Loose teeth
  - Aesthetic nuisance
  - Others

4. Experience of dental health services

4.1. Oral health consultation and treatment

- Main Question: I would like you to tell me about your experience with oral health treatment and services.
- Prompts: Have you had any treatment for your gums? What worries you most about having dental and gum treatment?
- Probes: - Comfortability during dental and gum treatment
  - Pleasant/ unpleasant treatment procedures
  - Good/ bad treatment results
  - Waiting time
  - Dentists' skills
  - Others

4.2. Quality and accessibility of oral health services

- Main Question: Could you please let me know about dental health facility that you usually utilise and why you chose this facility? (health centre, hospital, dental clinic, and other facilities)
- Prompts: Do you need someone to accompany you to the health facility? Do you think there is anything else that the health facility could do to improve their service to give you better service for you?
- Probes: - Professionalism in providing oral health treatment and service
  - Travel time to reach the health service
  - Cost (explicit and hidden costs) and affordability
  - Hospitality
  - Others

5. Harmful habits to oral health

5.1. Food and drinks

- Main Question: Tell me about your typical daily diet
- Prompt: Do you think what you eat affects your oral health condition?
- Probes:
  - Sugary foods and drinks
  - Balanced diet (vegetables, fruits, starchy foods, protein, milk and dairy foods)
  - Teeth staining foods and drinks (e.g. coffee, tea, strawberry)
  - Alcohol
  - Others

5.2. Behavior related to oral health

- Main Question: Could you please tell me about your habits that you think may affect your oral health? You may mention both of good and bad habits.
- Prompt: Could you please let me know if you have any of these habits: grinding teeth/clenching jaw/ nail biting/wedging toothpicks/ smoking/ chewing tobacco
- Probes:
  - Teeth grinding
  - Jaw clenching
  - Nail biting
  - Wedging toothpicks
  - Smoking (cigarette, cigar, pipe) or tobacco chewing
  - Others

Closing the interview

You have answered all of the questions I have for you.
Would you like to tell me anything else or ask me?
I thank you for participating in this study and talking to me today, I really appreciate it.
Have a great rest of your day and thank you again for your time!

Appendix 3.11 Interview topic guide in Indonesian

Panduan Topik Wawancara:

Penyakit periodontal dan kesehatan gigi-mulut yang berkaitan dengan kualitas hidup

1. Pengantar	
	1.1 Informasi mengenai penelitian
Informasi	• Penelitian ini mengenai kesehatan gigi-mulut dan kualitas hidup. • Kami melakukan survei kuesioner dan mewawancarai masyarakat Indonesia yang tinggal di Edinburgh untuk mengetahui pengalaman kesehatan gigi-mulut mereka. • Hari ini, Saya ingin berbincang dengan anda mengenai pengalaman anda akan kesehatan gigi-mulut, perawatan dan pelayanan kesehatan yang pernah anda gunakan. • Saya akan merekam suara wawancara hari ini agar saya dapat sepenuhnya mendengarkan pengalaman anda. • Semua informasi yang anda berikan kepada saya akan terjaga kerahasiaannya. Anda tidak akan dapat diidentifikasi dari apapun yang kami tulis setelah mewawancarai dan mengumpulkan data kuesioner anda.
	1.2 Informed consent dan sesi pra-wawancara
Instruksi Aksi Pertanyaan Instruksi	• Jika anda setuju dengan ini, silakan membaca lembaran informasi dan formulir persetujuan • Memberikan lembaran informasi dan formulir persetujuan • Apakah anda memiliki pertanyaan sebelum kita memulai wawancara? • Tolong beritahu saya apabila anda ingin berhenti atau beristirahat sejenak ditengah-tengah wawancara.
	1.3 Memulai wawancara
Aksi Pernyataan Pertanyaan	• Menyalakan perekam suara • Terimakasih telah menyetujui untuk berbicara dengan saya,melakukan wawancara dan memberikan persetujuan untuk berpartisipasi pada penelitian ini. • Bisakah anda ceritakan sedikit tentang diri anda

2. Informasi dan pengetahuan akan kesehatan gigi-mulut
2.1. Kesadaran akan kesehatan gigi dan mulut
• Pertanyaan utama: Saya ingin mengetahui apa pendapat anda tentang kesehatan umum dan kesehatan gigi-mulut. • Prompt: Apa arti kesehatan gigi dan mulut untuk anda? • Probes: - Hubungan antara kesehatan gigi-mulut dengan kesehatan umum. - Kerusakan gigi, kehilangan gigi. - Kualitas hidup - Lainnya
2.2. Perawatan kesehatan gigi dan mulut
• Pertanyaan utama: Bisakah anda ceritakan apa yang anda lakukan untuk merawat mulut anda? • Prompt: Apakah anda membutuhkan orang lain untuk membantu anda dalam menjaga kesehatan gigi dan mulut anda sehari-hari? • Probes: - Gosok gigi, benang gigi, obat kumur, dan alat-alat lain untuk membersihkan gigi dan gusi. - Makanan dan minuman bergula. - Kebiasaan merokok - Makanan yang seimbang (sayuran, buah-buahan, makanan bertepung (contohnya nasi, kentang,roti), protein, susu dan produk olahan susu) - Frekuensi menyikat gigi/ menggunakan benang gigi/ menggunakan obat kumur - Memeriksakan kesehatan gigi dan mulut secara berkala - Lainnya
2.3. Sumber informasi kesehatan gigi dan mulut
• Pertanyaan utama: Darimana biasanya anda mendapatkan informasi mengenai kesehatan gigi dan mulut? • Prompt: Apakah anda merasa telah mendapatkan informasi yang cukup mengenai kesehatan gigi dan mulut? • Probes: - Dokter gigi/ perawat gigi/ staff kesehatan - Televisi, radio, majalah, leaflet - Keluarga dan teman - Lainnya
2.4. Pengaruh atau saran dari keluarga/ teman/ rekan
• Pertanyaan utama: Saya ingin mengetahui pendapat anda tentang sikap keluarga/ teman/ rekan anda terhadap kesehatan gigi dan mulut? • Prompt: Pernahkah anda mendiskusikan masalah kesehatan gigi dan mulut anda dengan keluarga atau teman? • Probes: - Rekomendasi mengenai bagaimana cara menjaga kesehatan gigi dan mulut - Saran mengenai dokter gigi atau fasilitas kesehatan - Lainnya

3. Pengalaman akan masalah gigi dan mulut

3.1. Pengalaman sakit gigi dan mulut

- Pertanyaan utama: Dapatkah anda memberi tahu saya mengenai pengalaman anda dengan masalah gigi dan mulut?
- Prompts: Bagaimana anda mendeskripsikan pengalaman anda dengan masalah gigi dan gusi?
- Probes: - Nyeri/ rasa sakit
  - Bau mulut
  - Mulut kering
  - Kesulitan mengucapkan kata-kata
  - Gangguan pada indera pengecapan
  - Ketidaknyamanan pada saat makan/ gangguan makan
  - Gangguan pada aktivitas sehari-hari/ kesulitan melakukan pekerjaan sehari-hari
  - Kesadaran diri, merasa malu
  - Merasa tegang, sulit untuk beristirahat
  - Tidak dapat berfungsi
  - Lainnya

3.2. Pemicu untuk mencari perawatan/ pengobatan

- Pertanyaan utama: Keadaan seperti apa yang membuat anda berfikir bahwa anda memiliki masalah gigi dan gusi?
- Prompts: Apa yang anda lakukan untuk meredakan rasa sakit atau perasaan tidak nyaman dari masalah gigi/ gusi? Bagaimana jika gejala terus berlanjut dan bertambah parah?
- Probes: - Sakit hilang timbul/ sakit terus menerus/ sakit akut
  - Gusi berdarah
  - Bernanah
  - Bengkak
  - Gigi longgar
  - Gangguan estetik
  - Lainnya

4. Pengalaman akan pelayanan kesehatan gigi

4.1. Konsultasi dan perawatan kesehatan gigi dan mulut

- Pertanyaan utama: Saya ingin anda menceritakan tentang pengalaman anda akan perawatan dan pelayanan kesehatan gigi dan mulut?
- Prompts: Pernahkah anda menjalani pengobatan untuk masalah gusi? Apa yang paling membuat anda khawatir tentang pengobatan gigi dan gusi?
- Probes: - Kenyamanan saat pengobatan gigi dan gusi
  - Prosedur pengobatan yang menyenangkan / tidak menyenangkan
  - Hasil pengobatan gigi dan gusi yang baik / buruk
  - Waktu menunggu
  - Keahlian dokter gigi
  - Lainnya

4.2. Kualitas dan keterjangkauan pelayanan kesehatan gigi dan mulut

- Pertanyaan utama: Bisakah anda memberitahu saya mengenai fasilitas kesehatan gigi yang biasa anda gunakan dan mengapa anda memilih fasilitas ini? (puskesmas, rumah sakit, klinik gigi, dan fasilitas lainnya)
- Prompts: - Apakah anda membutuhkan orang lain untuk menemani anda datang ke fasilitas kesehatan ini?
  - Apakah anda merasa ada hal lain yang dapat dilakukan oleh fasilitas kesehatan untuk meningkatkan pelayanan dalam rangka memberikan pelayanan yang lebih baik untuk anda?
- Probes: - Profesionalisme dalam menyediakan pengobatan dan pelayanan gigi dan mulut
  - Waktu tempuh perjalanan untuk mencapai fasilitas kesehatan.
  - Biaya (biaya eksplisit dan tersembunyi) dan keterjangkauan
  - Keramahan
  - Lainnya

5. Kebiasaan yang berbahaya bagi kesehatan gigi dan mulut

5.1. Makanan dan minuman

- Pertanyaan utama: Ceritakan tentang diet khas harian anda
- Prompt: - Apakah anda merasa bahwa apa yang anda makan dan minum dapat mempengaruhi kesehatan gigi dan mulut anda?
- Probes: - Makanan dan minuman bergula
  - Makanan yang seimbang (sayuran, buah-buahan, makanan bertepung, protein, susu and produk olahan susu)
  - Makanan dan minuman yang menyebabkan pewarnaan (misalnya kopi, teh, stroberi)
  - Alkohol
  - Lainnya

5.2. Kebiasaan buruk untuk gigi

- Pertanyaan utama: Tolong anda sebutkan kebiasaan-kebiasaan yang anda rasa dapat mempengaruhi kesehatan gigi dan mulut?
- Prompt: - Apakah anda memiliki salah satu dari kebiasaan-kebiasaan ini: menggertakan gigi/ mengepalkan rahang/ mengigit kuku/ medesak gigi dengan tusuk gigi/ merokok/ mengunyah tembakau
- Probes: - Menggertakan gigi
  - Mengepalkan rahang
  - Mengigit kuku
  - Mendesak gigi dengan tusuk gigi
  - Merokok (rokok, cerutu, rokok pipa/cangklong) atau mengunyah tembakau
  - Lainnya

Penutup wawancara

Anda telah menjawab semua pertanyaan yang saya miliki.
Apakah masih ada yang ingin anda ceritakan kepada saya atau ada pertanyaan?
Saya berterimakasih atas partisipasi anda dalam penelitian ini, Saya sangat menghargainya.
Selamat menikmati hari anda dan sekali lagi terimakasih atas waktu anda!

Appendix 4.1 Pilot: Ethics approval letter from CPHS Ethics Committee

THE UNIVERSITY of EDINBURGH

Centre for Population Health Sciences
THE USHER INSTITUTE of POPULATION HEALTH SCIENCES AND INFORMATICS
The University of Edinburgh
Medical School
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22 August 2016

Dear Marisza

Re: Development of interview topic guide and questionnaire: Periodontal diseases and oral health related quality of life in Indonesian population – PILOT study only

Thank you for submitting English and Indonesian language versions of the consent form, with the suggested cosmetic change to the format. This consent form supersedes the previously approved version and has been filed as the *current* version. I am pleased to be able to ***confirm*** that the above PILOT study was granted ethical approval on 19th August, and this is unchanged.

Please be aware that this ethical approval is in respect of the protocol and methods as described in the documents submitted to the committee (with amended documents superseding predecessors), and in respect of the PILOT study only. If there is in the future *a change* to the study design/protocol/methods, you should check whether this means your level 2 application form needs to be revised, and submit to the committee (via me), any documents that have been revised (study materials/protocol/level 2 form), using tracked changes. You should make clear in your covering email whether:

(i) you are requesting ethical review of a study amendment; or

(ii) you are not sure whether such is needed and, in the first instance, would like the committee's opinion on whether a formal approval is needed of the amended design/methods.

Well done on your attention to all the requests and suggestions made, and very best wishes for this first stage of your PhD research – the pilot study.
Yours sincerely

Diane White
Ethics Review Group Administrator

Appendix 4.2 Pilot: Interview topic guide in English

Topic Guide for Interview in:
Periodontal Diseases and Oral Health Related Quality of Life in Indonesian People Living in Edinburgh, UK

1.1 Introduction	
	1.1. Information about study
Information	• This study is looking at oral health and well-being. • We are conducting questionnaire survey and talking to Indonesian people living in Edinburgh to understand their oral health experience. • Today I would like to speak to you about your oral health problems experience, treatment and services you have used. • I would like to audio-record the interview today so that I could fully listen to your experience. • Any information that you share with me will be kept confidential. You will not be identifiable from anything we write after interviewing and collecting questionnaire data from you.
	1.2. Informed Consent and pre-interview section
Instruction Action Question Instruction	• If you are happy with this, please have a read over the information sheet and consent form. • Give information sheet and informed consent form • Do you have any questions before we start the interview? • Please let me know at any point if you want to stop or take a break
	1.3. Start the Interview
Action Statement Question	• Turn on audio recorder • Thank you for agreeing to speak to me, be interviewed, and gave your consent as a participant in this research. • Could you please tell me a bit about yourself?

2. Information and knowledge regarding oral health

2.1. Oral health awareness

- Main Question: I would like to know what you think about general health and oral health.
- Prompt: What does oral health mean to you?
- Probes : - Relation between oral health and general health
  - Tooth decay, tooth loss, etc.
  - Quality of life
  - Others

2.2. Oral health maintenance

- Main Question: Could you please tell me about what do you do to take care of your mouth?
- Prompt: Do you need someone to help you taking care of your daily oral health?
- Probes: - Brushing, flossing, mouthwash, other tools to clean teeth and gums
  - Sugary food and drink
  - Smoking habit
  - Balanced diet (vegetables, fruits, starchy foods (e.g. rice, potato, bread), protein, milk and dairy foods)
  - Frequency of brushing/ flossing/using mouthwash
  - Regular dental check-ups
  - Others

2.3. Source of oral/dental health information

- Main Question: Where do you usually get information about oral health?
- Prompt: Do you feel that you have received enough information about it?
- Probes: - Dentist/ dental nurse/ health staff
  - Television, radio, magazines, leaflet
  - Family and friends
  - Others

2.4. Influence or advice from family/ friends/ colleague

- Main Question: I would like you to tell me what you think about your family/ friend/ colleague attitude toward oral health.
- Prompt: Have you ever discuss your oral health problems with your family or friends?
- Probes: - Recommendations about how to maintain oral health
  - Suggestions regarding dentist/ health facilities
  - Others

3. Experience of oral/ dental problems
3.1. Oral health diseases experience
• Main Question: Could you please tell me about your experience with dental or gum diseases? • Prompts: How would you describe your experience with dental or gum problems? • Probes: - Soreness/ painful aching - Bad breath - Dry mouth - Trouble in pronouncing any words - Interference in sense of taste - Uncomfortable to eat/ interrupt meals - Daily activities disrupted/ difficulties in performing daily activities - Self-conscious, embarrassed - Felt tense, difficult to rest - Unable to function - Others
3.2. Triggers to search for care/ treatment
• Main Question: What circumstances make you think that you have a dental/ gum problems? • Prompts: What did you do to overcome the pain or uncomfortable feelings from dental /gum problems? What if the symptoms continue and get worse? • Probes: - Intermittent/ continuous/ severe pain - Gum bleeding - Pus - Swollen - Loose teeth - Aesthetic nuisance - Others

4. Experience of dental health services

4.1. Oral health consultation and treatment

- Main Question: I would like you to tell me about your experience with oral health treatment and services.
- Prompts: - Have you had any treatment for your gums?
  - What worries you most about having dental and gum treatment?
- Probes: - Comfortability during dental and gum treatment
  - Pleasant/ unpleasant treatment procedures
  - Good/ bad treatment results
  - Waiting time
  - Dentists' skills
  - Others

4.2. Quality and accessibility of oral health services

- Main Question: Could you please let me know about dental health facility that you usually utilise and why you chose this facility? (health center, hospital, dental clinic, and other facilities)
- Prompts: - Do you need someone to accompany you to the health facility?
  - Do you think there is anything else that the health facility could do to improve their service in order to give you better service for you?
- Probes: - Professionalism in providing oral health services
  - Travel time to reach the health service
  - Cost (explicit and hidden costs) and affordability
  - Hospitality
  - Others

5. Harmful habits to oral health

5.1. Food and drinks

- Main Question: Tell me about your typical daily diet
- Prompt: Do you think what you eat affects your oral health condition?
- Probes:
  - Sugary foods and drinks
  - Balanced diet (vegetables, fruits, starchy foods, protein, milk and dairy foods)
  - Teeth staining foods and drinks (e.g. coffee, tea, strawberry)
  - Alcohol
  - Others

5.2. Harmful habits for mouth

- Main Question: Could you please tell me about your habits that you think may affect your oral health?
- Prompt: Could you please let me know if you have any of these habits: grinding teeth/clenching jaw/ nail biting/wedging toothpicks/ smoking/ chewing tobacco
- Probes:
  - Teeth grinding
  - Jaw clenching
  - Nail biting
  - Wedging toothpicks
  - Smoking (cigarette, cigar, pipe) or tobacco chewing
  - Others

Closing the interview

You have answered all of the questions I have for you.
Would you like to tell me anything else or ask me?
I thank you for participating in this study and talking to me today, I really appreciate it.
Have a great rest of your day and thank you again for your time!

Appendix 4.3 Pilot: Interview topic guide in Indonesian

Panduan Topik Wawancara:
Penyakit periodontal dan kesehatan gigi-mulut yang berkaitan dengan kualitas hidup pada masyarakat Indonesia yang tinggal di Edinburgh, UK

1. Pengantar	
	1.1. Informasi mengenai penelitian
Informasi	• Penelitian ini mengenai kesehatan gigi-mulut dan kualitas hidup. • Kami melakukan survei kuesioner dan mewawancarai masyarakat Indonesia yang tinggal di Edinburgh untuk mengetahui pengalaman kesehatan gigi-mulut mereka. • Hari ini, Saya ingin berbincang dengan anda mengenai pengalaman anda akan kesehatan gigi-mulut, perawatan dan pelayanan kesehatan yang pernah anda gunakan. • Saya akan merekam suara wawancara hari ini agar saya dapat sepenuhnya mendengarkan pengalaman anda. • Semua informasi yang anda berikan kepada saya akan terjaga kerahasiaannya. Anda tidak akan dapat diidentifikasi dari apapun yang kami tulis setelah mewawancarai dan mengumpulkan data kuesioner anda.
	1.2. Informed consent dan sesi pra-wawancara
Instruksi Aksi Pertanyaan Instruksi	• Jika anda setuju dengan ini, silakan membaca lembaran informasi dan formulir persetujuan • Memberikan lembaran informasi dan formulir persetujuan • Apakah anda memiliki pertanyaan sebelum kita memulai wawancara? • Tolong beritahu saya apabila anda ingin berhenti atau beristirahat sejenak ditengah-tengah wawancara.
	1.3. Memulai wawancara
Aksi Pernyataan Pertanyaan	• Menyalakan perekam suara • Terimakasih telah menyetujui untuk berbicara dengan saya,melakukan wawancara dan memberikan persetujuan untuk berpartisipasi pada penelitian ini. • Bisakah anda ceritakan sedikit tentang diri anda?

2. Informasi dan pengetahuan akan kesehatan gigi-mulut

2.1. Kesadaran akan kesehatan gigi dan mulut

- Pertanyaan utama: Saya ingin mengetahui apa pendapat anda tentang kesehatan umum dan kesehatan gigi-mulut.
- Prompt: Apa arti kesehatan gigi dan mulut untuk anda?
- Probes: - Hubungan antara kesehatan gigi-mulut dengan kesehatan umum.
  - Kerusakan gigi, kehilangan gigi.
  - Kualitas hidup
  - Lainnya

2.2. Perawatan kesehatan gigi dan mulut

- Pertanyaan utama: Bisakah anda ceritakan apa yang anda lakukan untuk merawat mulut anda?
- Prompt: Apakah anda membutuhkan orang lain untuk membantu anda dalam menjaga kesehatan gigi dan mulut anda sehari-hari?
- Probes: - Gosok gigi, benang gigi, obat kumur, dan alat-alat lain untuk membersihkan gigi dan gusi.
  - Makanan dan minuman bergula.
  - Kebiasaan merokok
  - Makanan yang seimbang (sayuran, buah-buahan, makanan bertepung (contohnya nasi, kentang,roti), protein, susu dan produk olahan susu)
  - Frekuensi menyikat gigi/ menggunakan benang gigi/ menggunakan obat kumur
  - Memeriksakan kesehatan gigi dan mulut secara berkala
  - Lainnya

2.3. Sumber informasi kesehatan gigi dan mulut

- Pertanyaan utama: Darimana biasanya anda mendapatkan informasi mengenai kesehatan gigi dan mulut?
- Prompt: Apakah anda merasa telah mendapatkan informasi yang cukup mengenai kesehatan gigi dan mulut?
- Probes: - Dokter gigi/ perawat gigi/ staff kesehatan
  - Televisi, radio, majalah, leaflet
  - Keluarga dan teman
  - Lainnya

2.4. Pengaruh atau saran dari keluarga/ teman/ rekan

- Pertanyaan utama: Saya ingin mengetahui pendapat anda tentang sikap keluarga/ teman/ rekan anda terhadap kesehatan gigi dan mulut?
- Prompt: Pernahkah anda mendiskusikan masalah kesehatan gigi dan mulut anda dengan keluarga atau teman?
- Probes: - Rekomendasi mengenai bagaimana cara menjaga kesehatan mulut
  - Saran mengenai dokter gigi atau fasilitas kesehatan
  - Lainnya

3. Pengalaman akan masalah gigi dan mulut

3.1. Pengalaman sakit gigi dan mulut

- Pertanyaan utama: Dapatkah anda memberi tahu saya mengenai pengalaman anda dengan masalah gigi dan mulut?
- Prompts: Bagaimana anda mendeskripsikan pengalaman anda dengan masalah gigi dan gusi?
- Probes:
  - Nyeri/ rasa sakit
  - Bau mulut
  - Mulut kering
  - Kesulitan mengucapkan kata-kata
  - Gangguan pada indera pengecapan
  - Ketidaknyamanan pada saat makan/ gangguan makan
  - Gangguan pada aktivitas sehari-hari/ kesulitan melakukan pekerjaan sehari-hari
  - Kesadaran diri, merasa malu
  - Merasa tegang, sulit untuk beristirahat
  - Tidak dapat berfungsi
  - Lainnya

3.2. Pemicu untuk mencari perawatan/ pengobatan

- Pertanyaan utama: Keadaan seperti apa yang membuat anda berfikir bahwa anda memiliki masalah gigi dan gusi?
- Prompts:
  - Apa yang anda lakukan untuk meredakan rasa sakit atau perasaan tidak nyaman dari masalah gigi/ gusi?
  - Bagaimana jika gejala terus berlanjut dan bertambah parah?
- Probes:
  - Sakit hilang timbul/ sakit terus menerus/ sakit akut
  - Gusi berdarah
  - Bernanah
  - Bengkak
  - Gigi longgar
  - Gangguan estetik
  - Lainnya

4. Pengalaman akan pelayanan kesehatan gigi

4.1. Konsultasi dan perawatan kesehatan gigi dan mulut

- Pertanyaan utama: Saya ingin anda menceritakan tentang pengalaman anda akan perawatan dan pelayanan kesehatan gigi dan mulut?
- Prompts: - Pernahkah anda menjalani pengobatan untuk masalah gusi?
  - Apa yang paling membuat anda khawatir tentang pengobatan gigi dan gusi?
- Probes: - Kenyamanan saat pengobatan gigi dan gusi
  - Prosedur pengobatan yang menyenangkan / tidak menyenangkan
  - Hasil pengobatan gigi dan gusi yang baik / buruk
  - Waktu menunggu
  - Keahlian dokter gigi
  - Lainnya

4.2. Kualitas dan keterjangkauan pelayanan kesehatan gigi dan mulut

- Pertanyaan utama: Bisakah anda memberitahu saya mengenai fasilitas kesehatan gigi yang biasa anda gunakan dan mengapa anda memilih fasilitas ini? (puskesmas, rumah sakit, klinik gigi, dan fasilitas lainnya)
- Prompts: - Apakah anda membutuhkan orang lain untuk menemani anda datang ke fasilitas kesehatan ini?
  - Apakah anda merasa ada hal lain yang dapat dilakukan oleh fasilitas kesehatan untuk meningkatkan pelayanan dalam rangka memberikan pelayanan yang lebih baik untuk anda?
- Probes: - Profesionalisme dalam menyediakan pelayanan gigi dan mulut
  - Waktu tempuh perjalanan untuk mencapai fasilitas kesehatan.
  - Biaya (biaya eksplisit dan tersembunyi) dan keterjangkauan
  - Keramahan
  - Lainnya

5. Kebiasaan yang berbahaya bagi kesehatan gigi dan mulut

5.1. Makanan dan minuman

- Pertanyaan utama: Ceritakan tentang diet khas harian anda
- Prompt: Apakah anda merasa bahwa apa yang anda makan dan minum dapat mempengaruhi kesehatan gigi dan mulut anda?
- Probes: - Makanan dan minuman bergula
  - Makanan yang seimbang (sayuran, buah-buahan, makanan bertepung, protein, susu and produk olahan susu)
  - Makanan dan minuman yang menyebabkan pewarnaan (misalnya kopi, teh, stroberi)
  - Alkohol
  - Lainnya

5.2. Kebiasaan buruk untuk gigi

- Pertanyaan utama: Tolong anda sebutkan kebiasaan-kebiasaan yang anda rasa dapat mempengaruhi kesehatan gigi dan mulut?
- Prompt: Apakah anda memiliki salah satu dari kebiasaan-kebiasaan ini: menggertakan gigi/ mengepalkan rahang/ mengigit kuku/ medesak gigi dengan tusuk gigi/ merokok/ mengunyah tembakau
- Probes: - Menggertakan gigi
  - Mengepalkan rahang
  - Mengigit kuku
  - Mendesak gigi dengan tusuk gigi
  - Merokok (rokok, cerutu, rokok pipa/cangklong) atau mengunyah tembakau
  - Lainnya

Penutup wawancara

Anda telah menjawab semua pertanyaan yang saya miliki.
Apakah masih ada yang ingin anda ceritakan kepada saya atau ada pertanyaan?
Saya berterimakasih atas partisipasi anda dalam penelitian ini, Saya sangat menghargainya.
Selamat menikmati hari anda dan sekali lagi terimakasih atas waktu anda!

Appendix 4.4 Pilot: Questionnaire in English

QUESTIONNAIRE ON DETERMINANTS OF ORAL HEALTH RELATED QUALITY OF LIFE

IDENTIFICATION :

Study number : Gender: Man / Woman

Date of Birth (DOB) :

Administration city : Edinburgh (Scotland, United Kingdom)

Name of researcher :

Date of questionnaire :

Time of questionnaire :

BACKGROUND INFORMATION

1. How old are you? ____ years old

2. What is your formal educational background?
    a. Never attended formal school
    b. Not completed elementary school
    c. Elementary school
    d. Junior high school
    e. High school/ vocational school
    f. College/ University

3. What is your marital status?
    a. Single
    b. Married
    c. Divorce
    d. Widowed

4. What is your current job status?
    a. Working for government or public sector
    b. Working for private sector
    c. Self-employed
    d. Unemployed
    e. Retired
    f. Others (please specify):_____

5. Which kinds of income do you personally receive?
    a. Earnings from employment
    b. Pension from former employer
    c. State pension
    d. Interest from savings / investments
    e. Earnings from spouse (for example: husband/wife)
    f. Other, please specify_____

6. Could you please estimate your household monthly income?
    a. Up to £1000
    b. £1001 - £1500
    c. £1501 - £2000
    d. £2001 - £ 2500
    e. £2501 - £ 3000
    f. More than £3000

7. How many people live in your household?_____

SMOKING AND TOBACCO USE

8. Which of the statements matches your experience of smoking a cigarette/ a cigar/ a pipe/ chewing tobacco?
    a. I smoke nowadays
    b. I chew tobacco nowadays
    c. I am a former smoker / tobacco chewer
    d. I have never smoked or chewing tobacco → Go to Question 13

9. How long have you been smoking/ chewing tobacco? / How long had you been smoking/ chewing tobacco?
    a. Less than 5 years
    b. 5-10 years
    c. More than 10 years

10. How many cigarettes do you smoke per day? / How many cigarettes you used to smoke per day?
    a. Less than 10 cigarettes/ day
    b. 10-19 cigarettes/ day
    c. More than 19 cigarettes / day
    d. I have never smoked, but I have chewed tobacco

11. How many grams of tobacco do you chew per day? / How many grams of tobacco you used to chew per day?
    a. Up to 5 grams
    b. More than 5 grams
    c. I have never chewed tobacco, but I have smoked

12. How long have you stop smoking/ chewing tobacco?
    a. Less than 5 years
    b. 5-10 years
    c. More than 10 years
    d. I am still smoking/chewing tobacco

DIABETES STATUS

13. What is your current diabetes status?
    a. No diabetes → Go to Question 17
    b. Diabetes type 1 (Insulin dependent diabetes mellitus (IDDM))
    c. Diabetes type 2 (Non-insulin dependent diabetes mellitus (NIDDM))
    d. Diabetes, but I don't know which type of diabetes I have suffered

14. How old were you when first diagnosed with diabetes?
    a. Less than 40 years old
    b. 40 years old and above

15. What kind of therapy do you receive for your diabetes management? (you may choose multiple option)
    a. Insulin injection
    b. Oral hypoglycaemic agent and other oral medications
    c. Controlled diet
    d. Regular exercise
    e. Smoking cessation
    f. Other (please specify):_____

16. How long have you had diabetes?
    a. Less than 5 years
    b. 5-10 years
    c. More than 10 years

CURRENT ORAL HEALTH BEHAVIOUR

17. How often do you brush your teeth nowadays?
    a. More than twice a day
    b. Twice a day
    c. Once a day
    d. Less than once a day

18. Do you use any of the following to clean your teeth? (you may choose multiple option)
    a. Toothbrush
    b. Dental floss
    c. Interdental brush/toothpicks/woodsticks
    d. Mouthwash
    e. Electric toothbrush
    f. Denture cleaning solution
    g. Sugar-free chewing gum
    h. Other (please specify): _____

19. If you have denture, how often do you clean your dentures nowadays? (Question refers to all types of cleaning)
    a. More than twice a day
    b. Twice a day
    c. Once a day
    d. Less than once a day
    e. I don’t have denture

PATTERN OF DENTAL ATTENDANCE

20. How often do you go to dentist?
    a. At least once every six months
    b. At least once every year
    c. Only when having trouble with teeth/dentures
    d. Never been to dentist

GENERAL / ORAL HEALTH

21. How is your health in general; would you say it is…
    a. Very good
    b. Good
    c. Fair
    d. Bad
    e. Very bad

22. (And) would you say your dental health (mouth, teeth and/or dentures) is...
    a. Very good
    b. Good
    c. Fair
    d. Bad
    e. Very bad

Thank you for answering.

Appendix 4.5 Pilot: Questionnaire in Indonesian

KUESIONER MENGENAI PENENTU KESEHATAN GIGI DAN MULUT YANG BERKAITAN DENGAN KUALITAS HIDUP

IDENTITAS:

Nomer Studi : Jenis Kelamin: Laki-laki/ Wanita

Tanggal Lahir (TTL) :

Kota : Edinburgh (Scotland, United Kingdom)

Nama peneliti :

Tanggal pengisian kuesioner :

Waktu pengisian kuesioner :

INFORMASI MENGENAI LATAR BELAKANG

1. Berapa usia anda? ____ tahun

2. Apa latar belakang pendidikan formal anda?
   a. Tidak pernah bersekolah
   b. Tidak lulus Sekolah Dasar (SD)
   c. Sekolah Dasar (SD)
   d. Sekolah Menegah Pertama (SMP)
   e. Sekolah Menegah Atas (SMA)/ Sekolah Menengah Kejuruan (SMK)
   f. Universitas

3. Apa status pernikahan anda?
   a. Single
   b. Menikah
   c. Bercerai
   d. Duda/Janda karena pasangan telah meninggal

4. Apa status pekerjaan anda saat ini?
   a. Karyawan pemerintah atau sektor publik
   b. Karyawan swasta
   c. Bekerja untuk diri sendiri
   d. Tidak bekerja
   e. Pensiunan
   f. Lainnya (sebutkan):_____

5. Apa jenis pendapatan yang anda terima saat ini?
   a. Pendapatan dari bekerja
   b. Pensiun dari tempat dulu bekerja
   c. Pensiun dari negara
   d. Bunga dari tabungan/ investasi
   e. Pendapatan dari pasangan (contoh: suami/istri)
   f. Lainnya, (sebutkan):_____

6. Dapatkah anda estimasi perkiraan pendapatan bulanan rumah tangga anda?
   a. Sampai dengan £1000
   b. £1001 - £1500
   c. £1501 - £2000
   d. £2001 - £ 2500
   e. £2501 - £ 3000
   f. Lebih dari £3000

7. Berapa orang yang tinggal dalam rumah tangga anda?_____

MEROKOK DAN PENGGUNAAN TEMBAKAU

8. Manakah dari pernyataan ini yang sesuai dengan pengalaman anda dalam merokok rokok filter/ cerutu/ rokok pipa/ mengunyah tembakau?
    a. Saya merupakan perokok aktif saat ini
    b. Saya merupakan pengunyah tembakau aktif saat ini
    c. Saya merupakan mantan perokok/ pengunyah tembakau di waktu yang lalu
    d. Saya tidak pernah merokok ataupun mengunyah tembakau Menuju ke Pertanyaan Nomer 13

9. Berapa lama anda telah merokok/ mengunyah tembakau? / Berapa lama anda dulu pernah merokok/ mengunyah tembakau?
    a. Kurang dari 5 tahun
    b. 5-10 tahun
    c. Lebih dari 10 tahun

10. Berapa banyak rokok yang anda hisap per hari? / Berapa banyak rokok yang anda biasa hisap dulu waktu anda merokok per hari?
    a. Kurang dari 10 rokok/ hari
    b. 10-19 rokok/ hari
    c. Lebih dari 19 rokok / hari
    d. Saya tidak pernah merokok, tetapi saya mengunyah tembakau

11. Berapa gram tembakau yang anda kunyah per hari? / Berapa gram tembakau yang anda biasa kunyah dulu waktu anda mengunyah tembakau per hari?
    a. Sampai dengan 5 gram
    b. Lebih dari 5 gram
    c. Saya tidak pernah mengunyah tembakau, tetapi saya merokok

12. Berapa lama anda telah berhenti merokok/ mengunyah tembakau?
    a. Kurang dari 5 tahun
    b. 5-10 tahun
    c. Lebih dari 10 tahun
    d. Saya masih merokok/ mengunyah tembakau

DIABETES STATUS

13. Apa status penyakit diabetes anda saat ini?
    a. Tidak diabetes Menuju ke pertanyaan nomer 17
    b. Diabetes tipe 1 (diabetes mellitus bergantung insulin (IDDM))
    c. Diabetes tipe 2 (diabetes mellitus tidak tergantung insulin (NIDDM))
    d. Diabetes, tetapi saya tidak tahu tipe apa diabetes yang saya derita

14. Berapa usia anda ketika pertama kali didiagnosa diabetes?
    a. Kurang dari 40 tahun
    b. 40 tahun dan 40 tahun keatas

15. Apa jenis pengobatan yang anda terima untuk mengatasi diabetes anda? (Anda dapat memilih lebih dari satu opsi pilihan berikut ini)
    a. Suntikan insulin
    b. Oral hypoglycaemic agent dan obat-obatan oral lainnya
    c. Kontrol makanan
    d. Olahraga teratur
    e. Berhenti merokok
    f. Lainnya (sebutkan): _____

16. Berapa lama anda telah menderita diabetes?
    a. Kurang dari 5 tahun
    b. 5-10 tahun
    c. Lebih dari 10 tahun

PERILAKU KESEHATAN GIGI DAN MULUT SAAT INI

17. Seberapa sering anda menyikat gigi saat ini?
    a. Lebih dari dua kali sehari
    b. Dua kali sehari
    c. Satu kali sehari
    d. Kurang dari satu kali sehari

18. Apakah anda menggunakan dari pilihan berikut untuk membersihkan gigi anda? (Anda dapat memilih lebih dari satu opsi pilihan berikut ini)
    a. Sikat gigi
    b. Benang gigi
    c. Sikat interdental/tusuk gigi/ tusuk gigi kayu
    d. Obat kumur
    e. Sikat gigi elektronik
    f. Cairan pembersih gigi tiruan
    g. Permen karet bebas gula
    h. Lainnya (tolong sebutkan): _____

19. Jika anda memiliki gigi tiruan, berapa sering anda membersihkan gigi tiruan anda saat ini? (Pertanyaan mengacu pada semua jenis pembersihan gigi tiruan)
    a. Lebih dari dua kali sehari
    b. Dua kali sehari
    c. Satu kali sehari
    d. Kurang dari satu kali sehari
    e. Saya tidak memiliki gigi tiruan

POLA KEHADIRAN KE DOKTER GIGI

20. Seberapa sering anda pergi ke dokter gigi?
    a. Setidaknya 1 kali dalam 6 bulan
    b. Setidaknya 1 kali dalam 1 tahun
    c. Hanya ketika memiliki masalah dengan gigi dan mulut / gigi tiruan
    d. Tidak pernah ke dokter gigi

KESEHATAN UMUM, GIGI DAN MULUT

21. Bagaimana kesehatan anda secara umum; menurut anda kesehatan umum anda dapat dikatakan…
    a. Sangat baik
    b. Baik
    c. Sedang
    d. Buruk
    e. Sangat buruk

22. (Dan) menurut anda kesehatan gigi dan mulut anda (mulut, gigi dan/atau gigi tiruan anda) dapat dikatakan…
    a. Sangat baik
    b. Baik
    c. Sedang
    d. Buruk
    e. Sangat buruk

Terimakasih atas jawaban anda

Appendix 4.6 Pilot: Participant recruitment advert in English

Hello,

I am a PhD student at Edinburgh Dental Institute, the University of Edinburgh.

Would you like to be involved in a study about oral health and well-being?

Tell us what your views about what oral health problems and well-being issues are important to you, get involved in interview, questionnaire, and a group discussion session. This study will be conducted in your native language.

We will recruit 6 participants with these criteria:

- Gender: Female /Male
- Age: 20 years old and above
- Currently living in Edinburgh
- Indonesian student, employees, and dependents are welcome to participate

There will be 2 sessions of your participation:

- First session: Interview and questionnaire (± 1 – 2 hours)
  You may choose the date of your participation at your convenient time: Monday to Friday, 9th-23rd September 2016 (between 10 am and 5 pm).

- Second session: Group discussion (± 1 – 1,5 hours)
  Friday, 16th December 2016 (starting at 11 am).

- These two sessions will be held at the Edinburgh Dental Institute, 4th, Lauriston Building, Lauriston Pl, Edinburgh EH3 9HA.

There are high street vouchers of £30 which will be given to each participant as a reward. The vouchers will be given in two sessions: £15 after session 1 and £15 after session 2.

If you would like to participate and to know more information about this study, please send a message or you can contact me by email at

We really appreciate your contribution and help!

Thank you.

Appendix 4.7 Pilot: Participant recruitment advert in Indonesian

Hallo,

Saya mahasiswi PhD dari Edinburgh Dental Institute, the University of Edinburgh.

Apakah kamu ingin terlibat dalam studi tentang kesehatan mulut dan kualitas hidup?

Beritahu kami tentang pandangan kamu akan masalah kesehatan gigi dan mulut serta kualitas hidup yang kamu anggap penting, kamu dapat berpartisipasi dalam wawancara, kuesioner, dan sesi diskusi grup. Studi ini akan dilakukan dalam bahasa native kamu, Indonesia.

Kami akan merekrut 6 peserta dengan kriteria berikut ini:

- Jenis kelamin: Perempuan / Laki-laki
- Usia: 20 tahun keatas
- Saat ini tinggal di Edinburgh
- Mahasiswa, Karyawan, dan Pendamping (Istri/Suami/Patner) dapat berpartisipasi dalam studi ini.

Akan ada 2 sesi dari partisipasi kamu:

- Sesi pertama: Wawancara dan Kuesioner (± 1 – 2 jam)
  Kamu dapat memilih hari yang sesuai dengan kenyamanan waktu kamu: Senin – Jumat, 9-23 September 2016 (antara jam 10.00 – 17.00).

- Sesi kedua: diskusi grup (± 1 – 1,5 jam)
  Jumat, 16 December 2016 (mulai jam 11.00)

- Kedua sesi ini akan diadakan di Edinburgh Dental Institute, 4th, Lauriston Building, Lauriston Pl, Edinburgh EH3 9HA.

Akan diberikan voucher belanja senilai £30 yang akan diberikan kepada masing-masing peserta sebagai tanda terimakasih. Voucher akan diberikan dalam dua sesi: £15 setelah sesi 1 and £15 setelah sesi 2.
Jika kamu tertarik untuk berpartisipasi dan mengetahui lebih banyak informasi tentang studi ini, silahkan hubungi saya melalui message atau kontak email: hijryana.marisza@gmail.com.

Kami sangat menghargai bantuan dan kontribusi kamu!

Terimakasih.

Appendix 4.8 Pilot: Information leaflet in English

Edinburgh Dental Institute
University of Edinburgh

Information leaflet for participants having interviews, questionnaire, and group discussion session.

Study title:	Development of interview topic guide and questionnaire: Periodontal diseases and oral health related quality of life in Indonesian population
Supervisor:	1. Professor Angus Walls (Principal Supervisor) 2. Dr. Margaret MacDougall (Second Supervisor)
Researcher collecting data:	Marisza Hijryana (PhD student)

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand what kind of research is being done and what it will involve. Please take your time to read the following information carefully.

Thank you for reading this.

What is this document about?
This document explains what kind of study we are doing, what your rights are, and what will be done with your data. If there are any benefits or risks, they will be explained here. Please read the information below. If you are happy to take part in this study, we will offer you an informed consent form. By filling in, signing and dating to take part in this study, you will be agreeing to participate and to let us use your data in the ways specified in this information sheet and consent form.

What will my participation in this study involve?
You are about to participate in a study which involves interviews, questionnaire, feedback forms and a group discussion session. This study will take place in Edinburgh Dental Institute (EDI). We will ask you about your oral health and general health experiences.
Your interview, questionnaire, and feedback forms completion will be performed on the same day. We will contact you again to participate in a group

discussion session after we have finished with our data analyses.

Semi-structured interview:
Your interview will take form a series of questions about oral health problems, health facilities, and oral health habits. The interviews last at different amount of time with different people but commonly last between 30 minutes to an hour. We would like to record your opinions at the interview so that we could fully listen to you.

Interviewee feedback form:
After the interview session, we will ask you to fill out an interview feedback form. This session will last around 15-20 minutes. Please feel free to express your views and opinion in this session.

Questionnaire:
You will complete questionnaires about oral health and quality of life. The completion of this questionnaire takes a different amount of time with different people but commonly takes between 10-20 minutes.

Questionnaire feedback form:
After the questionnaire session, we will ask you to fill out a questionnaire feedback form. This session will last around 10-15 minutes. Please feel free to express your views and opinion in this session.

A group discussion session:
Once we have analysed the data from interview and questionnaire completion, we would like to bring all participants together to discuss our findings and help us to understand the outcomes. The researcher will send a mail/ an email of a copy of the research report to you one week prior to the group session. This report will summarise findings from the analysis of interviews. This report describes participants' views on oral health and well-being, including themes and relationships that emerge from these data. It is hoped that this one week would be adequate to allow you to read and consider the research findings at your convenience time.
The group session will take form of a discussion group with several other Indonesian participants and will be led by the researcher. In this discussion, you are encouraged to give your views regarding the findings. This session will last around 1- 1½ hours and will be audio-recorded to allow us to listen to your opinions over again.

What will be done with my data?

The data from your interview, questionnaire completion, and group discussion will be analysed after the data collection.

The recordings from all the interviews and the group discussion will be transcribed (typed up) and analysed. We need to be able to quote views stated in the interviews and the group discussion, to illustrate the reports in my PhD thesis and subsequent publications. However, the quotations will be made in such a way that it will not be possible for anybody reading those reports to identify you as a participant.

We will use your feedback forms data to improve interview and questionnaire as research instruments in this study.

What are possible risks and benefits of taking part?

There are no known risks to participation in this study.

The benefits: Involvement in this study means you are making contribution to our knowledge about oral health and quality of life issues.

We would like to offer you a gift voucher of £30 for taking part in this study which will be given in two stages: £15 after the interview-questionnaire session and £15 after the group discussion session.

Will your participation in this study be kept confidential?

Your participation in this study will be kept confidential in any published work. It is inevitable that individuals involved in a group discussion will become aware of the identity of others participating in the group. We will emphasize to all individuals participating in the group discussion that participation in this project is confidential and that they should not disclose the participation of the group discussion to others. No personal details that might identify you will be stored with your questionnaire/interview/feedback forms/ group discussion data which will be anonymized.

What is the participation type and the withdrawal rights of this research?

Your participation is voluntary, and you may withdraw from the study at any time and for any reason. If you withdraw from the study, you will not be asked to return any voucher already received.

What will happen in the end of the study?

After your participation in the interview, questionnaire and feedback forms completion, and group discussion session, your involvement in the study is over. We appreciate your contribution in this study.

What will happen to the results of the research study?
The results will be used to finalise the interview topic guide and questionnaire that has been developed for this study. The finalised interview topic guide and questionnaire will then be used as a part of a study of the impact of periodontal (gum) disease on quality of life in Depok (Indonesia). All the data collected will be analysed and reported in my PhD thesis, and the findings from the discussion session and interviews may be used in presentations or research articles. We will take care to make sure that your identity can not be ascertained from any discussion of survey findings or quotes from the interview/group discussion transcript.

Who have reviewed the study?
The study has been approved by the Centre for Population Health Sciences Research Ethics Committee.

If you have any concerns or complaints about this study, you may contact this address:
Professor Sarah Cunningham-Burley
Centre for Population Health Sciences
The University of Edinburgh
Tel: 0131 650 3217/ 651 1943
Email:

Contact information. This research is being conducted by the above-listed researchers at the University of Edinburgh.

You may have some questions after you have read this information sheet. Please feel free to ask me, **Marisza Hijryana**, to clear up any queries that you may have.

You will be given a copy of this information sheet and also a copy of the signed consent form to keep if you would like to participate in this study.

Thank you for your help!

Researcher contact address:

Marisza Hijryana
PhD student in dentistry
Edinburgh Dental Institute
The University of Edinburgh
Email:

Appendix 4.9 Pilot: Consent form in English

Edinburgh Dental Institute
University of Edinburgh

Study title:
Development of interview topic guide and questionnaire:
Periodontal disease and oral health related quality of life in Indonesian population

Consent Form

Please tick the box

1. I confirm that I have read and understand the information sheet for the above study. ☐
2. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
3. I agree to take part in the above study. I understand that my participation is voluntary and that I am free to withdraw at any time. ☐
4. a) I consent to having an interview and a group discussion session for the research project identified above. I understand that the interview and group discussion session will involve audio recording of my opinions and they will be transcribed. ☐

   b) I consent to completing questionnaire and feedback forms for the research project identified above. ☐
5. I agree that the recording from interview and group discussion, information from questionnaire and feedback forms, and any data derived from them may be kept securely for the duration of 10 years post completion PhD study. Physical records will be stored in locked cabinet ensuring maintenance of anonymity of the paper records. Electronic data will be stored securely with password protection within the Edinburgh University IT system. ☐
6. I agree that the recording from interview and group discussion, information from questionnaire and feedback forms, and any analyses drawn from them may be used for research purposes (PhD thesis, presentations, and research articles). ☐
7. I understand that I will not be identifiable in any of the reporting/quotes in all of those research written works. ☐

_____	_____	_____
Name of participant	Date	Signature
_____	_____	_____
Researcher	Date	Signature

Appendix 4.10 Pilot: Information leaflet in Indonesian

Edinburgh Dental Institute
University of Edinburgh

Lembar informasi untuk partisipasi peserta dalam wawancara, kuesioner, dan diskusi grup

Judul studi:	Pengembangan panduan topik wawancara dan kuesioner: Penyakit periodontal dan kesehatan gigi-mulut yang berkaitan dengan kualitas hidup.
Pembimbing:	1. Professor Angus Walls (Pembimbing utama) 2. Dr. Margaret MacDougall (Pembimbing Kedua)
Peneliti yang mengumpulkan data:	Marisza Hijryana (Mahasiswi S3)

Anda diundang untuk berpartisipasi dalam studi penelitian ini. Sebelum anda memutuskan untuk berpartisipasi atau tidak, penting bagi anda untuk memahami penelitian yang akan dilakukan dan apa saja yang akan dilakukan. Silahkan luangkan waktu anda untuk membaca informasi berikut ini dengan seksama.

Terimakasih untuk membaca informasi ini.

Tentang apa dokumen ini?
Dokumen ini menjelaskan tentang studi yang akan kita lakukan, hak anda, dan apa yang akan dilakukan dengan data anda. Jika ada keuntungan dan resiko dari partisipasi anda, hal tersebut akan dijelaskan disini. Silakan membaca informasi berikut ini. Jika anda menyetujui untuk berpartisipasi dalam studi ini, kami akan memberikan lembar persetujuan untuk berpartisipasi kepada anda. Dengan mengisi, menandatangani dan memberi tanggal untuk berpartisipasi, berarti anda telah menyetujui untuk berpartisipasi dalam studi ini dan mengijinkan kami menggunakan data anda dengan cara tertentu yang disebutkan pada lembar informasi dan lembar persetujuan.

Apa saja yang akan saya lakukan pada penelitian ini?
Anda akan berpartisipasi dalam sebuah penelitian yang mencakup wawancara, kuesioner, lembar umpan balik dan diskusi grup. Studi ini akan dilakukan di Edinburgh Dental Institute (EDI). Kami akan bertanya kepada anda mengenai kesehatan gigi dan mulut serta kesehatan umum.
Wawancara, kuesioner, dan pengisian lembar umpan balik akan dilakukan pada hari yang sama. Kami akan menghubungi anda kembali untuk berpartisipasi dalam diskusi grup setelah kami selesai dengan analisis data.

Wawancara semi-struktur:
Wawancara berisi serangkaian pertanyaan tentang problem kesehatan gigi dan mulut, fasilitas kesehatan, dan kebiasaan yang mempengaruhi kesehatan gigi dan mulut. Lama wawancara berbeda-beda pada peserta yang berbeda, tetapi umumnya berlangsung sekitar 30 menit sampai dengan 1 jam. Kami ingin merekam opini anda pada saat wawancara sehingga kami dapat sepenuhnya mendengarkan anda.

Lembar umpan balik wawancara:
Setelah sesi wawancara, kami akan meminta anda untuk mengisi lembar umpan balik. Sesi ini akan berlangsung sekitar 15-20 menit. Silahkan mengekspresikan pandangan dan opini anda pada sesi ini.

Kuesioner:
Anda akan mengisi kuesioner tentang kesehatan mulut dan kualitas hidup. Lama pengisian kuesioner berbeda-beda pada peserta yang berbeda tetapi pada umumya membutuhkan waktu antara 10-20 menit.

Lembar umpan balik pengisian kuesioner:
Setelah sesi kuesioner, kami akan meminta anda untuk mengisi lembar umpan balik kuesioner. Sesi ini akan berlangsung sekitar 10-15 menit. Silahkan mengekspresikan pandangan dan opini anda pada sesi ini.

Sesi grup member-checking:
Setelah kami menganalisa data dari wawancara dan pengisian kuesioner, kami akan mengundang semua peserta untuk berdiskusi mengenai temuan kami dan membantu kami untuk memahami hasil tersebut. Peneliti akan mengirimkan salinan laporan penelitian melalui pos/ email satu minggu sebelum sesi grup ini. Laporan ini akan merangkum hasil analisa wawancara. Laporan ini berisi pandangan peserta mengenai kesehatan gigi dan mulut serta kualitas hidup, termasuk tema dan asosiasi yang berasal dari data tersebut. Diharapkan waktu satu minggu dapat memungkinkan anda untuk membaca dan mempertimbangkan hasil penelitian ini pada waktu yang

nyaman bagi anda.
Sesi grup ini akan berupa diskusi grup dengan beberapa partisipan Indonesia lainnya dan akan dipimpin oleh peneliti. Di dalam diskusi ini, anda dianjurkan untuk memberikan pandangan anda terhadap hasil penelitian. Sesi ini akan berlangsung selama 1 – 1,5 jam dan akan direkam secara audio untuk memungkinkan kami mendengarkan kembali pendapat anda.

Apa yang akan dilakukan dengan data saya?
Data yang diperoleh dari wawancara, pengisian kuesioner, dan diskusi grup akan dianalisa setelah proses pengumpulan data.
Rekaman dari semua wawancara dan diskusi grup akan ditranskripsi (diketik) dan dianalisa. Kami perlu mengutip pandangan anda yang disebutkan dalam wawancara dan diskusi grup untuk disertakan pada laporan tesis S3 saya dan publikasi-publikasi. Tetapi kutipan yang akan disertakan akan dibuat sedemikian rupa sehingga tidak akan memungkinkan bagi siapa pun yang membaca laporan tersebut untuk mengidentifikasi anda sebagai peserta.
Kami akan menggunakan umpan balik dari anda untuk memperbaiki wawancara dan kuesioner sebagai instrument penelitian pada studi ini.

Apakah resiko dan manfaat dari partisipasi anda?
Tidak ada risiko yang diketahui dari berpartisipasi anda dalam studi ini.
Manfaat: Partisipasi dalam studi ini berarti anda telah berkontribusi kepada pengembangan pengetahuan mengenai kesehatan gigi dan mulut, serta kualitas hidup.
Kami ingin memberikan hadiah voucher senilai £ 30 untuk partisipasi anda dalam studi ini yang akan diberikan dalam 2 tahap: £15 setelah sesi wawancara-kuesioner dan £15 setelah sesi diskusi grup.

Apakah partisipasi anda dalam studi ini akan dirahasiakan (confidential)?
Partisipasi anda dalam studi ini akan dirahasiakan pada publikasi-publikasi kami. Tidak dapat dipungkiri bahwa individu-individu yang terlibat pada diskusi kelompok akan mengenali identitas peserta lainnya. Kami akan menekankan kepada semua peserta yang berpartisipasi pada diskusi grup bahwa partisipasi dalam studi ini adalah confidential dan mereka tidak boleh mengungkapkan partisipasi dalam grup ini kepada orang lain. Tidak ada data personal anda yang akan disimpan bersama dengan data kuesioner/ wawancara/lembar umpan balik/ diskusi grup yang akan dianonimkan.

Apakah jenis partisipasi dan hak menarik diri dari penelitian ini?
Partisipasi anda dalam penelitian ini bersifat sukarela, anda dapat menarik diri dari studi ini setiap saat dan untuk alasan apapun. Jika anda menarik diri

dari studi ini, anda tidak akan diminta untuk mengembalikan voucher yang telah anda terima.

Apa yang akan terjadi di akhir penelitian?
Setelah partisipasi anda dalam wawancara, pengisian kuesioner dan lembar umpan balik, dan diskusi fokus grup, keterlibatan anda pada studi ini berakhir. Kami sangat menghargai kontribusi anda pada studi ini.

Apa yang akan dilakukan terhadap hasil penelitian ini?
Hasil penelitian ini akan digunakan untuk finalisasi panduan topik wawancara dan kuesioner yang telah dikembangkan untuk studi ini. Hasil finalisasi panduan topik wawancara dan kuesioner akan digunakan sebagai bagian dari studi tentang dampak penyakit periodontal (gusi) pada kualitas hidup di |Jakarta (Indonesia). Semua data yang terkumpul akan dianalisa dan dilaporkan pada tesis S3 saya, dan temuan dari sesi diskusi dan wawancara dapat digunakan pada presentasi dan artikel penelitian. Kami akan memastikan bahwa identitas anda tidak dapat diketahui dari diskusi tentang temuan survei atau kutipan wawancara/diskusi grup transkrip.

Siapa yang telah mengkaji studi ini?
Penelitian ini telah disetujui oleh Centre for Population Health Sciences Research Ethics Committee.

Jika anda memiliki masalah atau keluhan mengenai studi ini, anda dapat menghubungi alamat ini:
Professor Sarah Cunningham-Burley
Centre for Population Health Sciences
The University of Edinburgh
Tel: 0131 650 3217/ 651 1943
Email: Sarah.C.Burley@ed.ac.uk

Kontak informasi. Penelitian ini dilakukan oleh para peneliti dari the University of Edinburgh pada daftar nama diatas.

Jika anda memiliki pertanyaan tentang apa yang anda telah baca, silahkan bertanya kepada saya, **Marisza Hijryana**, untuk mendapatkan jawaban dari pertanyaan anda.

Anda akan diberikan salinan dari lembar informasi ini dan salinan lembar persetujuan yang telah anda tandatangani untuk anda simpan jika anda ingin berpartisipasi dalam studi ini.

Terimakasih atas bantuan anda!

Alamat Peneliti:

Marisza Hijryana
PhD student in dentistry
Edinburgh Dental Institute
The University of Edinburgh
Email: m.hijryana@sms.ed.ac.uk

Appendix 4.11 Pilot: Consent form in Indonesian

Edinburgh Dental Institute
University of Edinburgh

Judul studi:
Pengembangan panduan topik wawancara dan kuesioner:
Penyakit periodontal dan kesehatan gigi-mulut yang berhubungan dengan kualitas hidup.

Lembar Persetujuan

Silahkan mencentang kotak dibawah ini

1. Saya menyatakan bahwa saya telah membaca dan memahami lembar informasi untuk studi di atas. ☐

2. Saya telah memiliki kesempatan untuk mempertimbangkan informasi, mengajukan pertanyaan dan telah mendapatkan jawaban yang memuaskan. ☐

3. Saya setuju untuk mengambil bagian dalam studi di atas. Saya memahami bahwa keikutsertaan saya bersifat sukarela dan saya bebas untuk menarik diri setiap saat. ☐

4. a) Saya setuju untuk berpartisipasi dalam wawancara dan sesi diskusi kelompok untuk penelitian yang disebutkan di atas. Saya memahami bahwa wawancara dan sesi diskusi kelompok akan melibatkan rekaman suara pendapat saya dan akan ditranskrip. ☐
   b) Saya setuju untuk mengisi kuesioner dan lembar umpan balik untuk penelitian yang disebutkan di atas. ☐

5. Saya setuju bahwa rekaman dari wawancara dan diskusi grup, informasi dari kuesioner dan lembar umpan balik, dan data yang diperoleh dari hal tersebut dapat disimpan dengan aman selama 10 tahun pasca selesainya studi S3 peneliti. Catatan fisik akan disimpan dalam lemari terkunci dengan memastikan anonimitas dari catatan tersebut. Data elektronik akan disimpan dengan aman disertai proteksi password dalam sistem IT Edinburgh University. ☐

6. Saya setuju bahwa rekaman dari wawancara dan diskusi grup, informasi dari kuesioner dan lembar umpan balik, dan setiap analisis yang diambil dari hal tersebut dapat digunakan untuk tujuan penelitian (tesis S3, presentasi, dan artikel penelitian). ☐

7. Saya memahami bahwa saya tidak akan dapat diidentifikasi dari laporan /kutipan pada semua karya tulis penelitian tersebut. ☐

_____	_____	_____
Nama peserta	Tanggal	Tanda tangan
_____	_____	_____
Peneliti	Tanggal	Tanda tangan

Appendix 4.12 Pilot: Interviewee's feedback from in English

Interviewee Feedback Form

Please write down your comments/ feelings/views for the following questions. Please be critical and comfortable to express your views in this feedback form. We will use your feedback to improve the interview experience. If you have some questions about the questions in this form, please feel free to ask me, **Marisza Hijryana.**

Study number:

1. What was it like to be interviewed? Did the interview turn out as you expected?
2. Did you feel comfortable in the interview process? What was it that made you feel comfortable? Were there any aspect of the interview that made you uncomfortable? If there is any, what was it that made you uncomfortable?
3. Did you feel listened to by the interviewer? What was it that made you feel listened to/ not listened to?

4. Were there any questions that were difficult for you to understand? Could you please explain more about this?
5. Were there any questions that were difficult for you to answer? Could you please explain more about this?
6. Do you have any suggestions about how we could improve the interview experience? (regarding the interview questions, the interview place and atmosphere, the interviewer, and other things)

Thank you!

Appendix 4.13 Pilot: Questionnaire feedback form in English

Questionnaire Feedback Form

Please write down your comments/ feelings/views for the following questions. Please be critical and comfortable to express your views in this feedback form. We will use your feedback to improve the questionnaire. If you have some questions about the questions in this form, please feel free to ask me, **Marisza Hijryana.**

Study number:

1. What do you think about the questionnaire?
2. Were there any questions that were difficult for you to understand? Could you please explain more about this?

3. Were there any questions that were difficult for you to answer? Could you please explain more about this?
4. Do you have any suggestions about how we could improve the questionnaire for future use?

Thank you!

Appendix 4.14 Pilot: Interviewee's feedback from in Indonesian

Lembar Umpan Balik Wawancara

Silahkan menuliskan pendapat/ perasaan/ pandangan anda untuk menjawab pertanyaan-pertanyaan berikut ini. Silahkan mengkritisi dan mengekspresikan pandangan anda pada lembar umpan balik ini. Kami akan menggunakan tanggapan anda untuk memperbaiki pengalaman wawancara. Jika anda memiliki pertanyaan yang berhubungan dengan lembar ini, silahkan bertanya kepada saya, **Marisza Hijryana.**

Nomer studi:

1. Bagaimana rasanya diwawancara? Apakah wawancara anda berjalan seperti yang anda harapkan?
2. Apakah anda merasa nyaman selama proses wawancara? Tolong sebutkan apa yang membuat anda merasa nyaman? Apakah ada yang membuat anda merasa tidak nyaman selama proses wawancara? Jika ada, tolong sebutkan apa yang membuat anda merasa tidak nyaman?
3. Apakah anda merasa didengarkan oleh pewawancara? Apa yang membuat anda merasa didengarkan/ tidak didengarkan?

4. Apakah ada pertanyaan yang sulit anda mengerti? Bisa tolong jelaskan hal ini lebih lanjut?
5. Apakah ada pertanyaan yang sulit anda jawab? Bisa tolong jelaskan hal ini lebih lanjut?
6. Apakah anda memiliki saran tentang bagaimana kami dapat memperbaiki pengalaman wawancara anda? (sehubungan dengan pertanyaan wawancara, tempat dan suasana wawancara, pewawancara, dan hal lainnya)

Terimakasih!

Appendix 4.15 Pilot: Questionnaire feedback form in Indoesian

Lembar Umpan Balik Pengisian Kuesioner

Silahkan menuliskan pendapat/ perasaan/ pandangan anda untuk menjawab pertanyaan-pertanyaan berikut ini. Silahkan mengkritisi dan mengekspresikan pandangan anda pada lembar umpan balik ini. Kami akan menggunakan tanggapan anda untuk memperbaiki kuesioner ini. Jika anda memiliki pertanyaan yang berhubungan dengan lembar ini, silahkan bertanya kepada saya, **Marisza Hijryana.**

Nomer Studi:

1. Apa pendapat anda tentang kuesioner ini?
2. Apakah ada pertanyaan yang sulit anda mengerti? Bisa tolong jelaskan hal ini lebih lanjut?

3. Apakah ada pertanyaan yang sulit anda jawab? Bisa tolong jelaskan hal ini lebih lanjut?
4. Apakah anda mempunyai saran tentang bagaimana kami dapat memperbaiki kuesioner ini untuk digunakan dimasa depan?

Terimakasih!

Appendix 4.16 The details of the the questionnaire modification. The modifications are indicated by the blue colour words.

The issue raised by the participants	Modification to the questionnaire
Participant number 1 didn't understand about what denture cleaning solution is. She asked the interviewer to explain that to her (Question No. 18)	18. Do you use any of the following to clean your teeth? (you may choose multiple option) a. Toothbrush b. Dental floss c. Interdental brush/toothpicks/wood sticks d. Mouthwash e. Electric toothbrush f. Denture cleaning solution (if you have denture) g. Sugar-free chewing gum h. Other (please specify): ……
Participant number 2 suggested mentioning what the IDDM and NIDDM abbreviations stand for in the question about diabetes (Question No.13)	13. What is your current diabetes status? a. No diabetes → Go to Question 17 b. Diabetes type 1 (Insulin-dependent diabetes mellitus (IDDM)) c. Diabetes type 2 (Non-insulin dependent diabetes mellitus (NIDDM)) d. Diabetes, but I don't know which type of diabetes I have suffered
Participant number 6 suggested adding an option of separated in the question about marital status to cover people who have been separated from their spouse but have not divorced legally.	3. What is your marital status? a. Single b. Married c. Divorce/ Separated d. Widowed

Appendix 4.16 continued (1).

The issue raised by the participants	Modification to the questionnaire
Participant number 6 suggested to bold the things that should be emphasised: • Question No.8: option d. I have never smoked, or chewing tobacco → Go to Question 13 • Question No.21: Health in general • Question No.22: Dental health	8. Which of the statements matches your experience of smoking a cigarette/ a cigar/ a pipe/ chewing tobacco? a. I smoke nowadays b. I chew tobacco nowadays c. I am a former smoker / tobacco chewer **d. I have never smoked, or chewing tobacco → Go to Question 13** 21. How is your **HEALTH IN GENERAL**; would you say it is… a. Very good b. Good c. Fair d. Bad e. Very bad 22. (And) would you say your **DENTAL HEALTH** (mouth, teeth and/or dentures) is... a. Very good b. Good c. Fair d. Bad e. Very bad
Participant number 7 suggested to arrange the options in the Question No. 19 from general to specific	19. If you have denture, how often do you clean your dentures nowadays? (Question refers to all types of cleaning) **a. I don't have denture** b. Less than once a day c. Once a day d. Twice a day e. More than twice a day

Appendix 4.17 The details of the interview topic guide modification. The modifications are indicated by the blue colour words.

Issue raised by the participants	Modification to the interview topic guide
Participant number 6 mentioned she was confused about what to share about herself when the interviewer asked her to tell about herself.	**1. Introduction** • Could you please tell me a bit about yourself? It could be anything that you would like to share with me, such as your daily activities, etc.
Participant number 6 mentioned that few questions should be separated (asked one by one by the interviewer) to make the interviewee easier to answer the questions. For example: • Questions about general health and oral health • Questions about good and bad behaviour in oral health maintenance.	**2.Information and knowledge regarding oral health** 2.1. Oral health awareness • Main Question: I would like to know what you think about general health. And what do you think about oral health? 5.2. Behavior related to oral health • Main Question: Could you please tell me about your habits that you think may affect your oral health? You may mention any habits that you have.
Participant number 5 found that the questions about general health and oral health were difficult to answer because he thinks the topic was too broad. However, he acknowledged that the questions supposed to give him the opportunity to explain anything about the issues.	The researcher did not changed anything in the question about general and oral health. These questions aimed to give an overview of participant's knowledge regarding general and oral health issues.

Appendix 4.17 continued.

Issue raised by the participants	Modification to the interview topic guide
Participant number 1 mentioned that the air conditioner of the interview room was a bit too cold.	The interviewer paid more attention about the interview room temperature for the next interviewees. Researcher asked the next interviewee whether the temperature of the room was alright for them at the beginning of an interview.
Participant number 2 suggested that the interview sitting position could be better if not in the sitting position facing each other. She said that the sitting position would be more relax and informal if not facing each other.	The interviewer considered this suggestion and applied this suggestions when applicable.
Participant number 3 mentioned that she noticed that researcher was re-checking the recorder before the interview started. She suggested that the interviewer should do this before participant enters the interview room.	The interviewer paid more attention to the recorder preparation before participant enters the interview room.

Appendix 4.18 Pilot: Themes agreements identified from seven participants' interview transcriptions

Data related to experience of oral/dental problems		
Themes	**Sub-themes**	**Sources:** Number of the participants mentioned this issue (Study Number (SN))
1. Impairments due to oral health problems	• Bleeding gums • Brittle teeth • Dental abscess • Dental plaque and calculus • Missing teeth • Mouth ulcers • Receding gingiva • Sensitivity of teeth • Swollen gums • Teeth decay • Teeth fracture	• 4 (SN: 2, 3, 5, 6) • 1 (SN: 2) • 2 (SN: 1, 2) • 2 (SN: 3, 4) • 3 (SN: 2, 4, 5) • 4 (SN: 1, 3, 6, 7) • 1 (SN: 2) • 3 (SN: 1, 3, 7) • 2 (SN: 1, 2) • 5 (SN: 1, 2, 3, 4, 7) • 2 (SN: 1, 2)
2. Discomfort and pain due to oral health problems	• Bleeding gums • Brittle teeth • Dental abscess • Headaches • Mouth ulcers • Painful aching • Receding gums • Sensitivity of teeth • Swollen gums • Teeth fracture • Temporomandibular disorder	• 3 (SN: 2, 3, 5) • 1 (SN: 2) • 2 (SN: 1, 2) • 2 (SN: 1, 7) • 4 (SN: 1, 3, 6, 7) • 6 (SN: 1, 2, 3, 4, 5, 7) • 1 (SN: 2) • 4 (SN:1, 2, 3, 7) • 2 (SN:1, 2) • 1 (SN: 1) • 1 (SN: 2)
3. Functional limitation due to oral health problems	• Bad breath • Food catching in teeth • Poor appearance	• 3 (SN: 2, 4, 7) • 4 (SN: 2, 3, 6, 7) • 4 (SN: 2, 4, 6, 7)

4. Physical activity restriction due to oral health problems	• Affect general state of health • Difficult to fall asleep • Difficulty eating • Limitation to do daily activities • Limitation to get up from bed • Limitation to speak • A possibility of fainting	• 3 (SN: 1, 4, 5) • 1 (SN: 4) • 5 (SN: 1, 2, 3, 5, 7) • 4 (SN: 1, 2, 5, 7) • 1 (SN: 1) • 2 (SN: 2, 5) • 1 (SN: 1)
5. Psychological discomfort as a result of periodontal disease	• Poor appearance	• 4 (SN: 2, 4, 6, 7)
6. Psychological disability due to oral health problems	• Concentration affected • Mood affected	• 5 (SN: 1, 2, 4, 5, 7) • 2 (SN: 1, 4)
7. Behaviour changes after bad experiences of oral diseases	• Giving more priority to oral health more than ever before • Improving oral health maintenance • Be more aware of any changes in oral cavity	• 4 (SN: 1, 4, 5, 7) • 3 (SN: 1, 4, 7) • 5 (SN: 1, 4, 5, 6, 7)
8. Retrospective regret due to oral health problems		• 5 (SN: 2, 4, 5, 6, 7)

Data related to individual and environmental factors which may affect oral disease experiences		
Themes	**Sub-themes**	**Sources:** Number of the participants mentioned this issue (Study Number (SN))
1. Consideration in oral health care facilities utilization	• Accessibility of dental health services	• 2 (SN: 1, 2)
	• Allocated time slot for dental appointment	• 2 (SN: 1, 6)
	• Appointment waiting list	• 2 (SN: 2, 5)
	• Cost	• 6 (SN: 1, 2, 3, 5, 6, 7)
	• Dental instruments sterilisation	• 1 (SN: 6)
	• Dentist come late to the dental practice	• 1 (SN: 4)
	• Dentist's communication skills and attitude towards patients	• 3 (SN: 1, 6, 7)
	• Dentist's reputation	• 4 (SN: 1, 2, 3, 6)
	• Do not feel the need to go to dentist	• 2 (SN: 3, 6)
	• Facilities	• 5 (SN: 1, 3, 4, 6, 7)
	• Friendly dentist	• 5 (SN: 1, 2, 4, 6, 7)
	• Image of the dental health facilities	• 3 (SN: 1, 3, 6)
	• Informative or uninformative dentist	• 5 (SN: 1, 2, 3, 6, 7)
	• Knowledge of the health facility staff	• 1 (SN: 1)
	• Malpractice	• 2 (SN: 1, 3)
	• Misleading information from family, friends, or colleagues	• 1 (SN: 1)
	• Pain	• 4 (SN: 1, 4, 6, 7)
	• Proximity of dental services	• 3 (SN: 1, 2, 7)
	• Satisfaction with dental care and treatment	• 5 (SN: 1, 2, 4, 5, 6)
	• Someone to accompany to the health facility	• 5 (SN: 1, 2, 3, 4, 5)
	• Time to spent at dental waiting room	• 4 (SN: 1, 3, 4, 5)
	• Trust	• 3 (SN: 2, 5, 6)
	• Worry, fear, or traumatic	• 7 (SN: 1, 2, 3, 4, 5,

	experiences	6, 7)
	• Dental clinic's decoration and ambience	• 2 (SN: 1, 2)
	• Family dentist	• 4 (SN: 1, 3, 4, 5)
	• Based on urgency	• 1(SN: 7)
	• Equality between patient and dentist	• 2 (SN: 2, 3)
	• Dental insurance	• 1 (SN: 7)
2. Oral health maintenance	• Brushing teeth	• 7 (SN: 1, 2, 3, 4, 5, 6, 7)
	• Dental check-up	• 1 (SN: 1)
	• Flossing	• 4 (SN: 1, 2, 5, 6)
	• Gargling	• 6 (SN: 1, 3, 4, 5, 6, 7)
3. Diet (foods and drinks) habits	• Consumption of fruits, vegetables, and vitamins	• 6 (SN: 1, 2, 3, 5, 6, 7)
	• Drinking teeth staining, sugary, soft drinks, soda water or alcohol drinks	• 7 (SN: 1, 2, 3, 4, 5, 6, 7)
	• Snacking (salty and sugary snacks)	• 7 (SN: 1, 2, 3, 4, 5, 6, 7)
	• Eating and drinking hot or cold foods	• 4 (SN: 1, 3, 4, 7)
	• Eating sweet and sour foods	• 1 (SN: 7)
	• Rice, bread (carbohydrate)	• 5 (SN: 2, 3, 5, 6, 7)
	• Antibiotic	• 1 (SN: 2)
4. Harmful habits for mouth	• Wedging with toothpicks or other things	• 6 (SN: 1, 2, 3, 4, 5, 6)
	• Smoking	• 5 (SN: 1, 2, 4, 6, 7)
	• Nail biting and straw biting	• 2 (SN: 1, 6)
	• Teeth grinding	• 4 (SN: 2, 4, 6, 7)
	• Medication or drugs	• 2 (SN: 2, 6)
	• Betel nut chewing	• 1 (SN: 2)
	• Jaw clenching	• 2 (SN: 3, 7)

5. Source of oral/ dental health information	• Children's school • Dentist and health staff • Family, friends, and colleagues • School or University • Television, radio, newspaper, magazines, and leaflet • Websites and social media	• 2 (SN: 2, 6) • 4 (SN: 1, 5, 6, 7) • 7 (SN: 1, 2, 3, 4, 5, 6, 7) • 1 (SN: 6) • 5 (SN: 1, 2, 3, 4, 7) • 4 (SN: 1, 3, 4, 7)
6. Influence or advice from family/ friends/colleague	• Dietary habits • Exemplifies oral health maintenance habit • Ignorance to oral health • Suggestions for oral health disease problems • Recommendations for dentist or oral health facilities • Support from family, friends, or colleagues • Suggestions for oral health maintenance	• 3 (SN: 1, 2, 3) • 7 (SN: 1, 2, 3, 4, 5, 6, 7) • 5 (SN: 1, 4, 5, 6, 7) • 6 (SN: 1, 2, 3, 4, 6, 7) • 5 (SN: 1, 2, 3, 4, 5) • 4 (SN: 1, 2, 3, 5) • 5 (SN: 1, 3, 4, 5, 6)

Appendix 6.1 Details of the study participants who involved as interviewees

No	Gender	Age	BPE Score	Educational background
1	Male	76	3,4	Junior high school
2	Female	64	3,4,5	Junior high school
3	Female	66	3,4	Elementary school
4	Female	68	3,4	High school/ vocational school
5	Female	80	3	Not completed elementary school
6	Male	68	3,4	College/ University
7	Male	77	3,5	Elementary school
8	Male	63	3,4	High school/ vocational school
9	Female	67	3,4	High school/ vocational school
10	Female	68	3	Junior high school
11	Female	65	3,4,5	High school/ vocational school
12	Female	66	3,4	College/ University
13	Male	70	3	High school/ vocational school
14	Male	76	3	Junior high school
15	Female	60	3	College/ University
16	Male	63	3,4	High school/ vocational school
17	Male	64	3	High school/ vocational school
18	Male	73	3	High school/ vocational school
19	Male	75	3	Junior high school
20	Male	71	3	High school/ vocational school
21	Female	76	3,4	Junior high school
22	Female	65	3,6	College/ University
23	Female	65	3,4	Elementary school
24	Female	68	3,4,5	Elementary school
25	Male	60	3,4,5	Junior high school
26	Male	65	3	Junior high school
27	Male	68	3,4	Elementary school
28	Male	71	3	Elementary school
29	Female	70	3, 4, 5	Never attended formal school
30	Female	71	3	Not completed elementary school
31	Female	60	3	High school/ vocational school
32	Female	73	3	Not completed elementary school

*Participant number 24 could not continue the interviews as she felt tired and therefore excluded from the analysis.
*The details information about Basic Periodontal Examination (BPE) score performed can be found in Chapter 3.

Appendix 6.2 Themes identified regarding the impact of periodontal disease on the quality of life.

Themes	Sub-themes
Impairments related to oral health problems:	
a) Impairments likely related to periodontal disease	• Bleeding gums • Dental plaque, stain, and calculus • Dental abscess • Drifting tooth • Missing teeth • Receding gums • Redness and swollen gums • Tooth mobility • Sensitive teeth
b) Impairments likely related to other oral health problems	• Brittle teeth • Coated tongue • Mouth ulcer • Redness and swollen face • Retained roots • Teeth decay • Teeth fracture • Bleeding lips

Appendix 6.2 continued (1)

Themes	Sub-themes
Pain and physical discomfort due to oral health problems:	
a) Pain and physical discomfort likely related to periodontal disease	•Painful aching •Bleeding gums •Dental abscess •Receding gums •Redness and swollen gums •Tooth mobility •Sensitive teeth •Calculus and dental stain •Headaches
b) Pain and physical discomfort likely due to other oral health problems	•Brittle teeth •Mouth ulcers •Redness and swollen face •Retained roots •Teeth decay •Teeth fracture •Bleeding lips •Temporomandibular joint disorders •Mucocele
Functional limitations and physical activity restrictions caused by oral health problems:	
a) Functional limitations likely related to periodontal disease	•Bad breath •Cannot chew foods properly •Eating on one side •Food catching between teeth •Altered eating and food choice •Altered drinking •Difficulty to fall asleep •Limitation to do daily activities

Appendix 6.2 continued (2)

Themes	Sub-themes
b) Functional limitations as an impact of other oral health problems	• Acidic saliva • Dry mouth • Food stuck in teeth cavities • Altered taste (because of smoking) • Affect general state of health
Psychological discomfort as a result of periodontal disease	• Self-conscious about having bad breath or dirty teeth. • Anxiety about losing mobile teeth. • Worry about fainting possibility • Poor appearance
Psychological disability as an impact of periodontal disease	• Affect mood and emotion
Social disability due to oral health problems	• Affect interaction with others and self-confidence

Appendix 6.3 Themes identified regarding the individual and environmental factors which may affect periodontal disease experiences.

Themes	Sub-themes
Oral health maintenance	• Avoiding sugary foods • Brushing with bricks in the past time • Brushing with toothpaste • Chewing breath freshener mints • Dental check-up • Flossing • Gargle after eating or smoking • Gargle with betel leaves water • Gargle with mouthwash • Gargle with warm salt water • Help from family to maintain oral health • Not drinking teeth staining drinks • Quit smoking • Reducing or not eating hot or cold foods • Tongue scraping
Source of oral health information and behaviour in seeking oral health information	• Books • Dentist or health staff • Do not have any source of oral health information • Family and friends • Neighbours • Poster and leaflet at health facilities • Office event • School • Television and newspaper • Website, YouTube, and social media • Community organisation
Care and treatment used to overcome oral health problems	• Go to dentist or dental nurse • Go to unqualified person • Never been to a dentist • Self-care
Perceived need for dental care service	• Oral health conditions trigger to search for dental care and service • Reasons not to search dental care service

Appendix 6.3 continued (1)

Themes	Sub-themes
Access to oral health care	• Proximity of dental service • Cost • Dentist's communication skills and attitude • Waiting time at the health facilities • Worry, fear, or traumatic experiences • Satisfaction or dissatisfaction of the dental treatments • Health insurance • Availability of someone to accompany to the health facility • Misleading information • Trust • Recommendation from other people • Dentist's reputation • Daily quota of dental patients per day • Accessibility of dental services • Clean and comfort • Health facility's opening hours • Afraid of malpractice • Multi-visit dental treatment • Informative dentist • Worry about instruments sterilisation • Advanced dental equipment
Influence or advice from family/friends/colleague to overcome oral health problems	• Dietary habits • Giving good a example of oral health maintenance habit • Ignorance to oral health • Recommendations for dentist or oral health facilities • Sharing about dental health problems • Suggestions for oral health maintenance • Suggestions for oral health problems
Harmful habits to oral health	• Wedging with toothpicks or other things • Smoking • Using or chewing some leaves • Teeth grinding • Jaw clenching • Nail biting • Chewing ice cubes • Using teeth to open a bottle

Table 6. 3 continued (2)

Themes	Sub-themes
Traumatic experiences which affect participants' behaviour toward oral health	• Experienced by oneself (2, 18, 27, 28) • Experienced by other person (11, 15, 21)
Retrospectives regret related to oral health problems	

Appendix 6.4 Themes and sub-themes related to impairments due to oral health problems reported by the participants.

Impairments due to oral health problems	
Impairments likely related to periodontal disease	• Bleeding gums • Dental plaque, stain, and calculus • Dental abscess • Drifting tooth • Missing teeth • Receding gums • Redness and swollen gums • Tooth mobility • Sensitive teeth
Impairments likely related to other oral health problems	• Brittle teeth • Coated tongue • Mouth ulcer • Redness and swollen face • Retained roots • Teeth decay • Teeth fracture • Bleeding lips

Appendix 6.5 Themes and sub-themes related to pain and physical discomfort due to oral health problems reported by the participants.

Pain and physical discomfort due to oral health problems	
Pain and physical discomfort likely related to periodontal disease	• Painful aching • Bleeding gums • Dental abscess • Receding gums • Redness and swollen gums • Tooth mobility • Sensitive teeth • Calculus • Headaches
Pain and physical discomfort likely due to other oral health problems	• Brittle teeth • Mouth ulcers • Redness and swollen face • Retained roots • Teeth decay • Teeth fracture • Bleeding lips • Temporomandibular joint disorders • Mucocele

Appendix 6.6 Themes and sub-themes related to functional limitations and physical activity restrictions caused by oral health problems

Functional limitations and physical activity restrictions caused by oral health problems	
Functional limitations likely related to periodontal disease	• Bad breath • Cannot chew foods properly • Eating on one side • Food catching between teeth • Altered eating and food choice • Altered drinking • Difficult to fall asleep • Limitation to do daily activities
Functional limitations as an impact of other oral health problems	• Acidic saliva • Dry mouth • Food stuck in teeth cavities • Altered taste (because of smoking) • Affect general state of health

Appendix 6.7 Representative quotations to describe various way of oral health maintenance reported by the participants.

Other oral health maintenance ways	Representative quotations (participant's identifier)
Avoiding sugary foods	'*I have avoided any sweets foods. Although sometimes I still eat it and it usually caused me a toothache.' (SN 6, Male, 68 years)*
Chewing breath freshener mints	*'I don't feel comfortable with my bad breath. Thus, I chew some chewing gums because...Sorry for telling you this, but I think some of my friends have bad breath. I thought to myself "Oh my God, she has bad breath. Perhaps my breath also smells like her". So, I use chewing gums to avoid this kind of thing happen before somebody else notice my bad breath. You know, because we are the one who knows our conditions best than anyone else.'* (SN 23, Female, 65 years)
Dental check-up	'*I used to have general and oral health check-up while I was still working. Yes, check-up. It could be every six months or annually. However, I rarely go for a check-up after I have retired.'* (SN 19, Male, 75 years)
Flossing	*'I will use dental floss if using the toothbrush is unsuccessful to remove foods in between my teeth, especially the teeth on the back. They are hard to clean, so I like to use dental floss to clean them.'* (SN 22, Female, 65 years)
Help from family to maintain oral health	*'My wife prepares my toothbrush and toothpaste because sometimes I am really forgetful. She has prepared that every morning and afternoon up until today. Because of that, I know that she still loves me.'* (SN 16, Male, 63 years)

Appendix 6.7 continued

Other oral health maintenance ways	Representative quotations (participant's identifier)
Not drinking teeth staining drinks	'*I don't drink coffee nowadays as one of the ways to maintain my teeth'.* (SN 7, Male, 77 years)
Quit smoking	*'I used to smoke when I was still working, but I have quit now because I have retired now. Thank God, I have replaced that with Pagoda candy.'* (SN 1, Male, 76 years)
Reducing or not eating hot or colds foods	'*From my experiences, I shouldn't eat hot foods or cold foods in order to have healthy teeth and to avoid toothache. I have never drink with ice or hot drinks. I hope those things will make me able to enjoy my foods until the end of my life.'* (SN 6, Male, 68 years) '*One of the ways that I have done to maintain my teeth is avoiding any cold drinks. The last time I drink cold drinks was a long time ago, years ago. I want to keep my teeth and avoiding cold drinks can save me from teeth sensitivity pain.'* (SN 20, Male, 71 years)
Tongue scrapping	*'I think gums can make your breath smelly. Thus, I always try to clean it with toothbrush…because what I have seen from other people; they have something that looks like white fat in their gums. That makes me sure that gums can make bad breath as well. I always scrape my tongue as well.'* (SN 8, Male, 63 years)

Appendix 6.8 Representative quotations to describe various oral health information resources reported by the participants.

Oral health information resources	Representative quotations (participant's identifier)
Dentists or health professionals	*'Yes, the dentist gave some instructions at my first dental visit, such as how to brush the teeth and other things to maintain oral health. So after that, I have tried to do what she said.'* (SN 12, Female, 66 years)
Family and friends	*'I have normally received information about oral health from my family and close relatives as I rarely go to the health centre and dentists.'* (SN 11, Female, 65 years)
Neighbours	*'From the neighbourhood, I like to talk with the head of the neighbourhood, especially when we have a social gathering together. This event has become an opportunity for us to remind each other to maintain our health. It does not necessarily focus on the teeth only, but it includes general things.'* (SN 20, Male, 71 years)
Television and newspaper	*'I like to watch TV, and they have doctors in one of the TV program. Thus, I know certain side effects on the teeth. And of course, I watch various news on TV as well.'* (SN 26, Male, 65 years) '*Besides the dentists, I like to read books or sometimes from the newspapers we can get information about oral health as well.'* (SN 18, Male 73 years)
Books	*'If I found a book in the community library about teeth and mouth, I normally read it.'* (SN 13, Male, 70 years)
Posters and leaflet at health facilities	*'Sometimes at the health centre, we can found posters about dentist suggestions.'* (SN 4, Female, 68 years)

Appendix 6.8 continued

Oral health information resources	Representative quotations (participant's identifier)
Community organisation	*'There is information about it from PKK (a women community in Indonesia which aim to provide health education for family).'* (SN 21, Female, 76 years)
Office event	*'When I was on duty…my husband was working as a policeman, so I have an organization duty as his wife as well. There was various office event, and sometimes they invited doctors as well, the doctors give information to all the police wives.'* (SN 9, Female, 67 years)
School in the past	*'I received the information when I was at school.'* (SN 9, Female, 67 years)
Website, *YouTube* and social media	*'Like others, I have got information about teeth and mouth health from social media, television, and especially YouTube. These sources provide lots of information about how to maintain our teeth and mouth health.'* (SN 8, Male, 63 years)

Appendix 6.9 Representative quotations of various self-care regimes used by the participants to overcome oral health problems.

Oral health information resources	Representative quotations (participant's identifier)
Brushing and gargling	*'My teeth are longer, the gums are going down, so I feel dental pain. I brush my teeth with the toothpaste to reduce the pain. Thus I always brush my teeth once a day.'* (SN 30, Female, 71 years)
Brushing with bricks dust in the past	*'…when I had a toothache…I didn't know about a dentist when I lived in the village. I just brushed my teeth with bricks dust.'* (SN 6, Male, 68 years)
Chewing herbal leaves	*'It seemed that the irritation reached the gums. Then I rinsed before I went to bed. I gargled with warm water and salt. I also used Listerine or chew saga leaves to cure the ulcer. Alhamdulillah, it was cured.'* (SN 25, Male, 60 years)
Drinking warm water	*'I drink warm water if my teeth are starting to feel sensitive.'* (SN 9, Female, 67 years)
Eating soft diet	'*I feel my teeth are rocking and sensitive. Thus I try to eat just soft foods, and then I use warm water to brush my teeth so it won't feel sensitive. It is always too painful if I use cold water.'* (SN 20, Male, 71 years)
Gargle with betel leaves water	*'I try to rinse with betel leaves water or saltwater first. If it doesn't relieve the pain, then I will use Betadine gargle. If the pain still does not disappear after gargling with betadine, then I will take medicine.'* (SN 22, Female, 65 years)

Appendix 6.9 continued (1)

Oral health information resources	Representative quotations (participant's identifier)
Gargle with mouthwash	*'First, I brushed my teeth, and then I rinsed with warm saltwater just like my mother. After that, I used mouthwash. What was the brand of the mouthwash? It can reduce pain. That was the things I had done before I went to the dentist. For example, if I have a toothache during midnight or before bedtimes when it is impossible to go to the dentist straight away, I will do those steps first while waiting to fall asleep. At least that could help me reduce the pain.'* (SN 15, Female, 60 years)
Gargle with warm salt water	*'I usually take warm water and put salt on it. Then I will rinse it for 3 to 4 times, and then the pain will get better. But, the water must be hot enough.'* (SN 13, Male, 70 years)
Gargle with warm water	'*Yes, it (loose teeth) can lead to a headache. It can be excruciating. It got better after I rinse with warm water.'* (SN 25, Male, 60 years)
Holding ice cubes	*'I put ice cubes between my fingers for seven minutes when I had dental pain. Someone gave me the advice to do that. I did that, and apparently, the pain was gone. I didn't know whether it was just a psychological feeling, but the pain was gone.'* (SN 8, Male, 63 years)
Not eating hot or cold foods	'I will go to a dentist and tried to avoid any foods that may cause pain. For example, I didn't eat cold and hot foods so the pain will not get worse. (SN 4, Female, 68 years)

Appendix 6.9 continued (2)

Oral health information resources	Representative quotations (participant's identifier)
Using ointment	'*Lately, it is very often my gums swelling and painful…perhaps it is because I am old now. Then, I applied the ointment which I bought in Bogor on my gums. I used the ointment before bedtimes. My gums felt painful after I brushed my teeth, so I applied the ointment before going to bed. The next morning, I felt better. It felt soft, looks like an ulcer but felt soft when I touched it.'* (SN 31, Female, 60 years)
Oral medication	*'Oh, I went to the pharmacy when I felt a toothache before I went to a dentist. I bought Ponstan to reduce the pain. As far as I know, Ponstan will not sort the source of the toothache. It just sorts the pain temporarily. Thus, it doesn't give a permanent result. I still need to go to a dentist if I still feel a toothache after I eat the Ponstan.'* (SN 16, male, 63 years)
Reducing drinking sour drink	*'I have reduced drinking sour drinks, so that it won't cause me a toothache.'* (SN 1, Male, 76 years)
Stop eating on injured site	'*I have loose teeth. Sometimes it is hurt to chew with it. Thus, I only use my right side. I don't want to use the left side of my jaws.'* (SN 20, Male, 71 years)
Take a rest at home	'*I tried to endure the pain, then I went home and tried to sleep. I woke up when the pain got better. I couldn't stand to hear the noise because it made the pain more severe. I could feel the pain in the lower jaw teeth, and it went to my ears. The pain was spreading '* (SN 27, Male, 68 years)
Taking traditional medicine	*'I will drink Tolak Angin (*herbal traditional medicine sold in Indonesia) if I feel a toothache. The most vulnerable point will get affected when I catch a cold. So if the vulnerable point in my teeth, then I will get a toothache.'* (SN 8, Male, 63 years)

Appendix 6.9 continued (3)

Oral health information resources	Representative quotations (participant's identifier)
Using hot patch	*'…I couldn't eat, I couldn't chew. Thus I need to treat it with a hot patch to reduce the pain.'* (SN 6, Male, 68 years)
Using sap of herbal leaves	*'I felt I had a toothache for a long time, so I needed to know how to overcome the pain. I asked others. I thought it wasn't wrong to ask other people experiences with a toothache. Perhaps their solutions work for me as well. I said "Do you know how to get rid of a toothache? She answered, "Oh, I often had a toothache in the past, but now I have used the sap of Jatropha leaves ". Then I said "Where I can find it?" and she said, "I have lots at my home". I asked "How to use it? " "She said we only need to put the sap on cotton then place it at the painful area inside the mouth.'* (SN 5, Female, 80 years)
Wedging with toothpicks or other things	'*It is often that chicken meat stuck in between my front teeth. I have to use my nails to remove them from my teeth.'* (SN 7, Male, 77 years)
Self-tooth extractions	*'It was excruciating to eat with very loose teeth before the teeth pulled out. I pulled the loose teeth by myself. When the teeth were very mobile, then I pulled it out by myself. However, it was difficult for the teeth in the upper jaw because there were lots of nerves, but I managed to pull it out.'* (SN 25, Male, 60 years)

Appendix 6.10 Representative quotations to describe other considerations in dental services utilisation reported by the participants.

Consideration in oral health care utilization	Representative quotations (participant's identifier)
Trust	*'In my opinion, I have chosen a good dentist. I have to choose a qualified dentist. Thus I will have the self-confidence to go to this dentist, feeling safe, and I trust that this dentist will cure my oral health problems.'* (SN 15, Female, 60 years)
Recommendations from other people	*'People from everywhere come to the dental clinic in Jakarta. My friend told me "The dentists in this clinic are excellent". Thus, I went there for tooth extractions.'* (SN 26, Male, 65 years)
Dentist's reputation	'*There was a dentist named Susianto when I lived at Pasar Minggu. He was very well-known, but he has passed away now. It is OK if I have to pay quite expensive, the cost at the Susianto is expensive, Sintiawati dentist is also expensive. Although there is a health centre here and dental polyclinic at my office, I still choose to go to private. My colleague asked "Why you are not going to the dentist here? Why are you going home early? Are you going to queuing up for a dentist?" Yes, I always choose the dentist whom I think best for me. Also, there were lots of people coming from Jakarta to these two private dentists.'* (SN 15, Female, 60 years)

Appendix 6.10 continued (1)

Consideration in oral health care utilization	Representative quotations (participant's identifier)
Daily quota of dental patients per day at the government-funded health centre	*'Currently, if you go to the health centre and want to see a dentist, there is a daily quota of 10 patients. There are lots of people who want to go to the dentists. Finally, many people couldn't see a dentist and need to come on the other day. That is what I am worried about going there.'* (SN 6, Male, 68 years)
Accessibility of dental services	*'I always go there just on foot. If my problems are not so bad, I will just walk slowly. I don't need to be in a hurry like the others. I can go there at 8.30 or 9.00 am from my home then walk slowly.'* (SN 1, Male, 76 years)
Clean and comfort	*'The most important thing is about the place. The queuing, the waiting room has to be tidy and clean. Those things can make elderly patients feel comfortable.'* (SN 18, Male, 73 years)
Health facility's opening hours	*'The reason I choose to go to the private clinic when I was still working because the health centre is only open in the morning, isn't it? So I couldn't go there, but I could go to the private clinic after my working hours.'* (SN 8, Male, 63 years)
Afraid of malpractice	*'My friend had a bad experience with dental treatment. She had a tooth extraction. After that, she was sick and became so skinny. She told me it was because of the misleading dental treatment. Thus, I am afraid to go to the dentist provided by the office because my friend had a bad experience.'* (SN 15, Female, 60 years)

Appendix 6.10 continued (2)

Consideration in oral health care utilization	Representative quotations (participant's identifier)
Multi-visit dental treatment	*'Yes, I was back and forth to the dentist. I thought "Ah, I feel tired to go back and forth to the dentist". Thus, I asked other people how to sort that (a toothache), about what things I should drink. Then someone told me to use that (sap of Jatropha leaves). That was it…then the pain was gone.'* (SN 5, Female, 80 years)
Informative dentist	*'I received information from the first dentist whom I visited for the first time. I went to the dentist for the first time when I was 45 years old. He told me "The way you brush your teeth was wrong" then he taught me how to brush my teeth "This what you have done, and this is the correct way". I thought "Oh, I have been brushing my teeth wrongly for 45 years". After my first visit to the dentist, I have changed the way I brush my teeth. That was memorable for me.'* (SN 12, Female, 66 years)
Instruments sterilisation	*'Yes, just like what I told you about the sterilisation of the instruments. Frankly speaking, that is not only for a dentist but also for GPs. I hesitate to see the instruments used by several people. That is my considerations if I want to go to a dentist. That means all the instruments used inside the mouth, right? From anyone mouth.'* (SN 8, Male, 63 years)

Appendix 6.10 continued (3)

Consideration in oral health care utilization	Representative quotations (participant's identifier)
Advanced dental equipment	*'I think good dental service should be a service with a warm attitude. Thus people may feel touched by the services given. Then the instruments and the room should be cleaned, also there are more sophisticated dental instruments now.'* (SN 22, Female, 65 years)

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